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EDITORIAL.

THE EUGENICAL CHILD.

What subject could be better to touch upon during these first days of 1914 than the one which is uppermost not only in the medical mind but also in the lay mind. The eugenical child may still be very young, perhaps not quite so young as is 1914, but, even with this disadvantage, should there not already be signs that its supremacy over the old order of things can no longer be doubted? If we mistake not, the subject of the eugenical child was prosecuted by ardent eugenists some two years ago, and since matters run nowadays on very rapid wheels, propelled either by steam or electricity, and making due allowance for a full term pregnancy—even a eugenical child must suffer imprisonment in its mother's womb for nine months!—this marvel of the age must be in the twelvemonth of its earthly existence. But what indications are rife that it is among us, that it really has insignia that make it a thing apart to excite wonder and envy of a kindly nature, that it is an object lesson for all aspiring mothers who no longer wish to be burdened, as was the old-fashioned mother, with all those petty ills that weaklings have heretofore encouraged on account of a heritage that bespoke the wrong father? Perhaps our purblindness has stood in the way of our seeing clearly what is plain to every scribbler who writes enthusiastically on the valiance of some little St. George, who has his own peculiar way of combating the various dragons of disease and who is so decidedly enamored of social betterment that one feels his own little tatters are magnified into virtues of so high an order that imitation thereof would not be discouraged.

In a clever little essay by Max Beerbohm, entitled "Dickens,"* in which he burlesques the literary peculiarities of George Moore,

*A Christmas Garland. London: William Heinemann. 1912.

the English novelist and essayist, we read the following lines: "I had often wondered why when people talked to me of Tintoretto I always found myself speaking of Turgéneff. It seemed to me strange that I should think of Turgéneff instead of thinking of Tintoretto; for at first sight nothing can be more far apart than the Slav mind and the Flemish." And similar to George Moore, as seen by Max Beerbohm, the writer of these lines, whenever he hears that in the course of the next few years there will be among us many specimens of the eugenical child to warn us in no uncertain terms that the non-eugenical child must wind up as a human derelict, thinks, and not lightly either, of the children of the past and of the present—the children who have done a deal of good for the world, and are doing and will do the same amount—Mozart, Beethoven, Heine, Alfred de Musset, Chopin, Burns, Anatole France, George Meredith, Maeterlinck and many others. And he invariably thinks of the non-eugenical child when the eugenical is mentioned, because he has no faith in the latter product and also because the laws of heredity are but lamely understood at present and, for that matter, will never enjoy so perfect an interpretation that anyone shall be in a position to say he is prophet as to the outcome of the result of carefully laid plans. But he can hear the staunch upholders of the eugenical child say in their usual stentorian tones: "Syphilis will be eradicated, tuberculosis will be stamped out, weakly constitutions will be unknown, and brawn and muscle will be in their best estate. Who would wish for more, who would be so dissatisfied when this millennium occurs to demand an improvement over what we deem perfection." Clever ratiocination for live-stock, but can this reasoning be applied to mankind with profit?

Yes, we undoubtedly want healthy children in this world, healthy in mind and body, and this depends greatly on the parentage. But to have healthy children we need not go to the lengths of the eugenists who imagine that just because the man is free from syphilis or, as they so poetically express it, "from all hereditary taints"—does not this remind us of those not far-away days when we talked earnestly on the subject of scrofula?—and the woman has rosy cheeks and broad hips and a vitality that is unquestionable, the child resulting from such a union must be a Hercules with a mentality that has not a smithereen of abnormality to abase it. But, even granting that men and women dowered with strong muscles, strong nerves, healthy and optimistic views of life are the right sort of parents for eugenical children, will not the will-o'-the-wisp, heredity, play the world a trick none too seldom, and prove again and again its utter irresponsibility? And it is well that such should be the case, at least from our point of view, for despite all preparations

the child may be a surprise to the circle of eugenists who are watching its development and not be what they expected—a dryasdust little philosopher with an outlook so healthy that all who are not eugenists will flee the little bore to escape into a clearer atmosphere of naturalness, specked though it be with the usual faults of mankind. On the contrary it may develop into a Poe or Baudelaire or Francis Thompson, to mention a few outstanding names in literature that send a shiver down the spine of the bourgeoisie in all countries, or into cleaner and better men, not better writers, such as Masfield, Kipling and Galsworthy. And let us hope that it does, for we really need genius in this world—the replenishing is not too frequent in any country—since without it our social life is a very vapid affair at best, and must be continually athirst for the out-of-the-ordinary and have this gratified, or sink to a very low level, indeed.

The medical man of to-day who has made a study of the various facets of life, who is abnormal enough to be able to differentiate between the humdrum and the unusual, may not be altogether opposed to the eugenical movement in its milder phases,—he knows that syphilis is inheritable, that tuberculosis is or is not inheritable, that cancer is “in some families,” to quote from the lay opinions of to-day,—but is he at all enthusiastic about the laws which are being enacted so that that wonder of wonders will be forthcoming—the eugenical child? We take it his sanity of view is commendable, we take it he understands mankind—its mission, its purpose, its cycles with high lights and its cycles with low lights—and we take it that being a student of broad lines and few vagaries and crotchets he will see the folly of all this preparation to give to a world that is as contented to-day as it was some hundreds of years ago another problem to worry over that is really beyond the control of human power.

P. S.

HOW SHOULD A SURGEON DRESS?

The matter of dress has engaged the attention of man from time immemorial and in no period of history has life been so serious that it has been altogether neglected. Of course, when we look at some rare old prints our risibles are tickled to a state of hilarity to think that at any time that superior creature, man, had the temerity, nay the audacity, to cover himself with such ridiculous habiliments. But though our laughter may be loud and prolonged we should not forget that future generations will judge us in a like manner and wonder how we of this enlightened century could have so far

forgotten our dignity as to affect our present styles. It is well in its way to say that most men are above current styles of dress and that nothing pleases them more than to wear clothes that have the hall-mark of age. This may be so occasionally, but cannot this sort of affectation be traced to the sort of poverty, especially manifested in the young and ambitious medical man hoping for a paying clientele, which makes boast of an independence so that its tawdriness may be thought by all inquiring friends to be more akin to science than to what it really is—a gaping door whose threshold is rarely crossed by a paying patient? But how quickly all thought of science forsakes us, at least as illustrated in our dress, directly we are in a position to command material comforts; and since this statement is so evident that it cannot be contradicted with grace, should we be surprised that at the Clinical Congress of Surgeons recently held in Chicago, a surgeon well known in Seattle, Dr. Guy Shearman Peterkin, made the statement that surgeons when operating should dress in accordance with their moods? In Dr. Peterkin's own words, "there should be perfect harmony between a surgeon's clothing and the mood he happens to be in."

One must not take Dr. Peterkin's statement too literally, for if we do great indeed would be the wardrobe of the operating surgeon. Who has not heard, for instance, even of well-trained surgeons entering the operating room blithely, seizing the knife just as blithely because they were cocksure of their diagnosis, only to be greatly disappointed, if not chagrined, to find on opening the abdomen that judgment may at times be askew. In these circumstances, what is the surgeon to do in the matter of dress, we would ask Dr. Peterkin. In his blithe mood, no doubt pink and white would be the colors to affect, but how about the state of chagrin that happens none too rarely when a mistaken diagnosis is made? Of course, an attendant could be nearby with lavender or black habiliments, and directly the surgeon evidences signs of being greatly discomforted tear off his pink and white suit and immediately clothe him in sombre garments to match his mood. This little intermezzo during an operation might be carried out without much harm to the patient, but can a change be made so easily if a hemorrhage becomes so excessive that all hands around the table are as bees in a swarming hive? The patient, it is needless to say, would require the closest attention, but considering him of secondary importance, what change in clothing should the surgeon make to match his mood? Scarlet might be the color, for his mood is only too often one of great choler; but suppose it is a bit craven lest the patient die on the table? What then? This is a problem, indeed, that should be solved before long, for if not rightly advised the

surgeon, who has become an adherent of the Cult of Moods and Operations, may be guilty of a huge mistake—insist upon wearing too gay a color so as to hide his real feelings which are far from gay in the presence of blood that cannot be stemmed, and thus declare to his assistants that nothing serious need be expected; hence it is hands down and wait when the facts are screaming to the ceiling of the room that every assistant is needed and at once, so alarming is the situation.

From the foregoing it can be seen how important dress has become even for the male. This should not be at all surprising, for Darwin has already dwelt on the fact that in the animal world it is the male bird that has the most brilliant plumage. And since we are animals first and then by compulsion human beings of mincing gait and manners that are the quintessence of artifice, it should not surprise anyone that occasionally what is primitive—the indulgence in fine adornment—should assert itself. Moods, heretofore, have borne a bad reputation, since for some reason that has never been satisfactorily explained they have always been associated in the popular mind with saturnine persons. But with their elevation into a really spiritual atmosphere by Dr. Peterkin, they are worthy of a better interpretation, and if they can, as he says, be translated into a gayer plumage—we take it that he would deprecate sombre attire—a new chapter in man's attire has been written. And completely won over to Dr. Peterkin's way of thinking we shudder to think of the dire results to the patient and the clumsiness of the operator's hand should he attempt to aid an emergency case in evening clothes and tan shoes. This combination should be punished by law, but we doubt if a patient's death should first take place so as to call the lawgiver's attention to the heinousness of the offence.

P. S.

OPINION AND CRITICISM.

A LAYMAN'S ATTITUDE TOWARDS THE EUGENIC MARRIAGE LAWS.

The new Pennsylvania Marriage License Law prohibits the issuance of a marriage license to persons having transmissible diseases, and to imbeciles, persons under guardianship, and persons of unsound mind. The marriage of first cousins is forbidden. Furthermore, to secure a license a man must be able to show he can support a family. Finally, no license will be issued to persons "under the influence of liquors or narcotics."

There are some aspects of, and some questions regarding, this law which ought to be open for discussion to every member of the community, even if be neither a physician nor a lawyer. These aspects will be taken up in this article.

I. First of all, it is a matter of great surprise to a layman that such a law as the Pennsylvania Law should be discussed by the physician after, and not before it became a law. Of course, there is no intention on our part to put the blame on the physician. He has no specific duty to watch whether laws which are proposed by magistrates may possibly involve medical questions. But the magistrates are responsible for having acted without the advice of specialists, and following a vague public opinion. This absurd way of governing goes back to the days of Mr. Roosevelt when the definition of Lincoln, "Government of the people, for the people, by the people"—which, of course, may mean the wrong people or the right people, but we take it that Lincoln meant to say the right people—is replaced by a generous but blind notion of "Government of the masses, for the masses, *by the masses*."

What would the physician have said had he been consulted? It is a fact that Bateson, a world authority on this subject, censured the American laws at the London Congress in August of last year, arguing, according to the report of the press, that "nothing yet ascertained by genetic science justifies such a course." Not to speak of others,* there is in this issue of the JOURNAL another view of a medical authority condemning laws enforcing eugenics.

II. The layman is all the more surprised at this way of acting—if he is somewhat well read—because he knows that the belief in heredity is far from gaining ground. Of course, eugenic laws are not exclusively based on considerations of heredity. For instance,

*See two articles in the *Medical Record*, December 6th, 1913.

there is a provision that a new couple must prove that they have means of supporting a family, but evidently the question of heredity (mental and physical) is the chief concern, and the other part of the law would not have been suggested, had the medical law not been taken up. So let us postpone this question a little and first limit ourselves to the question of heredity.

The question of heredity and that of race are, of course, one and the same. Nobody pays much attention to it any more when it comes to a real issue. Some Pan-Germanists still follow Gobineau, but they are, one may almost say, the only people to-day, trying to take a scientific attitude towards such problems, who still betray a real belief or a practical belief in heredity.* Jean Finot's book "*Le Préjugé des Races*," translated into many languages, has new editions all the time; it shows for the general public that according to recent scientific data, race or heredity does not have so much to say in life, and that if it has, we cannot base our conduct on it, as the factors are so hopelessly mixed and numerous that we are in almost complete ignorance. We might recall also the measurements of Professor Boas of Columbia University, showing the extraordinary rapid influence of *milieu* on the immigrants.

Literature for a while emphasized theories of heredity. But what has happened in recent years? Zola, its chief advocate, is tedious to the new generation; and if one reads Maupassant, one will see that some of his stories are based on heredity (he being a disciple of the Realists) while others present the opposite theory. Ibsen's "Ghosts," a heredity play, is no longer played—except as a melodrama to tickle amateurs of strong sensations—but "Nora," which denies heredity, is the play of Ibsen which survives.

Then, on the other hand, we are all the time discussing education, not only moral and intellectual but also physical education, and this is because our inner selves come to believe in it more and more. For, of course, the more one allows to education, the less one allows to heredity. And after all, our very belief in eugenics (called upon for the new marriage laws) ought to make us very cautious; it is not all based on heredity, since athletics, for instance, *are* destined to 'eugenize' us. So though we may still talk a great deal about heredity, we can hardly be said to believe in it.

Suppose we know much more about heredity than we actually do, and that we can base our action on that knowledge; is it after all dignified of us to base everything on *physical* perfection? Many

*Of course, some scholars, as usual—and one ought not to blame them too much since scientists must be extremely cautious—will keep to tradition long after those dealing with practical problems have abandoned it; for instance, Professor Thorndike in his recent article in *Popular Science Monthly*, August, 1913. While they offer many affirmations, they offer very little proofs. They are saying constantly that children of the same family are alike, and education or surroundings do little to change them, but they ignore the fact that the first impressions of childhood in the family are fundamental. Now nothing proves that the characteristics of the children's minds are not due chiefly to the family *milieu*, and if teachers in class do not change children much, it may be through the fact that they are bad teachers.

physical dwarfs are mental giants. If heredity there is, this ought to be taken into account too. A physical wreck like the poet Pope—not to speak of St. Paul—is more to us than a pugilist like the negro Johnson. There may be some relation between physical strength and mental qualities, but those, for instance, who have served in the army (as the writer has) know that the qualities of endurance are by no means usually with the broad-shouldered and tall man, but are with the small nervous man; and in life it is not, *as a rule*, the fine, round-hipped woman who accomplishes most and the best things.

III. Finally, the layman can reflect on the question of the application of the law, and it is there especially that the law lends itself to criticism, from his point of view.

There will be various classes of people to be taken into consideration.

There will be the conscientious people—who will not marry anyway if they are in poor health; or if they go before the marriage clerk they may be unduly frightened in their conscience by some of the questions asked, and their honesty, which would be a guarantee of excellence for the good outcome of the marriage, will prevent the latter from taking place: the law here is more than useless.

The I-do-not-care-about-public-people—who quietly lie; and they can easily do so because the law, as framed, does not foresee any penalty. And no doctor's certificate is necessary. (In Wisconsin such is demanded; but it is doubtful whether even this will work.) Either the doctor will depend upon the applicant to answer certain questions, which again puts the thing in the hands of the applicant—and then what is the use of all this machinery?—or, suppose the person answers candidly, he or she may answer right or wrong; often not knowing what the doctor is driving at, he may well give a false impression either way. One may also suppose that the doctor will have to make a thorough examination; and now to this the applicant either will submit or not. If he does not submit, he will not go before the marriage license clerk, and will probably contract some illegal union. If he does submit, and the result of the examination is unfavorable, he will—do the same: for these people, also, the law is useless.*

The proud people—who will decide to take the whole thing as a joke, and answer questions in an evasive way, so as to be done with a ridiculous formality. . . .

Finally, the proud people—who will not accept the law at all. And, after all, who is it with any sense of dignity within himself who would accept being asked by some uneducated, silly clerk whether he or she is affected with disease, whether he or she is sound of mind or an imbecile (and, by the way, what is the differ-

*Not to mention the fact which even a layman knows, that "there are some cases of syphilitic infection that are not detectable by the Wassermann or any other test" (Williams and Brown, *Medical Record*, December 6th, 1913).

ence exactly between unsound in mind and an imbecile, which the law claims to make?). . . .

For all these people the law is useless.

The outcome will be this. Either the law will not be applied—then why make it?—or it will be applied and then only fools, liars, and frivolous people will be married, while honest but proud people, will go to some other state, if they do not marry outside the law.

The question of the means to support a family does not concern us specially in a medical journal; still, one word may be permitted, as this provision is part of the law. Only fools do marry when they have not money enough to do so, and no matter how great the number of fools in the world is, if you will make laws for all the foolish things that may happen, you may just as well give up making laws at all. Moreover, if you put so low an income that it means poor living anyway, what is, here again, the use of the law? If, on the other hand, you insist upon a comfortable living you may well cause latent energies to remain undeveloped. Comfort may stifle the higher faculties as well as develop them. That depends on a thousand things over which law will never have any control. How many of the greatest men of humanity would not have been great if they had not sharpened their faculties by struggle in early years? But let us grant this also, that a minimum income be required by law, then surely there ought to be another law preventing the other extreme, that is, people having over a certain income ought not to be allowed to marry either, because luxury is of all the worst thing for a child and leads to unhappiness and crime just as surely and just as often as extreme poverty.

* * * * *

All this, however, does not settle the question. Evidently since laws were passed in various states, even if these laws are bad, there must have been some reason which suggested the law, some evil to be remedied. The feeling that people marry without realizing the seriousness of their action is probably well justified; but what is needed to react is not a law, but a strong current of public opinion. Of course, it can be maintained that such laws as those we are discussing may help along the promotion of that same current of opinion. But there are other means (literature, church, social work, perhaps schools, even theatre) to achieve this end. And surely it must not be done at the expense of the prestige of the law. As the laws are now formulated, however, this is distinctly the case, for when people realize that the law is without teeth, they will ignore it and thus the sacredness of the law in general is impaired.

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LITERARY NOTE.

One is always in interesting company when one opens a new book by Mr. John Masefield, though it must be said as a warning to the over-refined reader that the company is a bit uncouth, a bit uneducated, and decidedly candid of expression. But though all these faults—if they are really faults—obtain, who can deny that every line that the poet has written is informed with an earnestness that makes the reader think and also makes him aware of the fact that “the tattered battalion which fights till it dies” is a very good subject to write about. Mr. Masefield need fear no rivalry in his self-appointed field of poetic activity, for no English poet of to-day or, for that matter, no poet of any nationality has his power of depicting the life of “the sailor, the stoker of steamers, the man with the clout.” If any doubt lingers in the mind of the reader that what has just been written is not deserving praise, let him turn to Mr. Masefield’s new book of poems “Salt Water Ballads” (The Macmillan Company, New York) and read the stirring and impassioned “Consecration,” the tragical nine lines which sum up the life of the sailor Bill, and the four poems of haunting melody which have already appeared in “The Story of a Round-House and Other Poems” but which lose nothing by reappearing in this volume—namely, “Sea-Fever,” “The West Wind,” “Sorrow of Mydath,” and “Tewkesbury Road.” Now though we are not ignorant of the fact that medical men care but little for modern poetry, that when they deliver their somewhat ponderous speeches at banquets they never forget to quote from Shakespeare or Walter Scott, it would be well for them to dip into this volume if only for the reason that they will become ‘acquainted’ with some poetry which for virility is unmatched to-day. It has been said, and very justly, that poetry makes its strongest appeal to womankind; but similar to all generalizations there is a false note in this too readily accepted opinion, for some poetry belongs exclusively to the male reader and cannot in any way enlist the sympathies of women. We have taken no statistics on the subject whether women like or dislike Mr. Masefield’s poetry, but even without such data we can say without any fear of criticism that any man, who has once been to sea or has lived in the open among those who talk like men unhampered by the thought of what their fellow-men might think of their primitive crudeness and value life perhaps a little too lightly but are redeemed for this by facing inevitable death heroically or when in the thrall of fate not whimpering, must be a very inferior being of a decidedly doltish disposition if he is not moved to admiration by the poems in the present volume. And just because this poetry is so virile, so swift in its flight from the author to the reader, so clean cut and so effective on account of its delineation of our faults and virtues without any circumlocution, we would advise every medical man, whose readings occasionally take him outside his medical books, to study Masefield’s poetry at once, not only in this volume but in his other volumes.

ORIGINAL ARTICLES.

EXPERIMENTAL EVIDENCE OF VARIATIONS IN ALIMENTARY SECRETIONS AND THEIR PATHOLOGICAL RESULTS.

By H. P. PICKERILL, M. D., Ch. B., M. D. S. (Birm.), L. D. S. (Eng.), of Otago, New Zealand,

Professor of Dentistry and Director of the Dental School in the University of Otago, N. Z.

In a communication to the *British Medical Journal* several years ago I stated as an enunciation that "the alimentary canal is a physiological and pathological entity." This would seem at first sight to resemble rather an axiom than an enunciation; it is, however, necessary to remember that the alimentary canal commences at the mouth. It is my present intention to show how intimately related is the first digestive cavity of the canal to the succeeding portions, primarily physiologically and secondarily pathologically.

I have for some time past been engaged in work on variations in salivary secretion occurring during the mastication of ordinary articles of diet. The results have been previously published,* and I only intend to refer to them quite briefly here. I have made certain suggestions with regard to the utilization and control of the salivary flow which if acted upon would, I believe, very largely eliminate the enormously high incidence of oral disease so universal in civilized communities at the present day.

Now the suggestions which I refer to were heterodox, they were in complete antithesis to traditional and accepted teaching; it therefore becomes important to show that such a line of treatment would not be deleterious to the following portions of the digestive canal. I desire to show that *what is best for the mouth is best for the remainder of the alimentary tract*; that, in fact, the several digestive cavities are governed by identical or similar laws, and further, from the point of view of initiating and maintaining normal alimentary secretions and peristalsis, the mouth is *the most important part of the whole canal*.

It is proposed to indicate, therefore, first in what way the salivary secretion is normally stimulated and then to show in what way and

*Cartwright Essay, Royal College of Surgeons of England, published as "Prevention of Dental Caries and Oral Sepsis." London. 1912.

to what extent gastric, pancreatic, and biliary secretions are in accord with this or are influenced by similar stimuli.

Salivary Secretion.—It is important to recognize that salivary secretion is normally a reflex one, and that the normal stimulant to the flow is the food we eat, and, as I propose to show, dif-

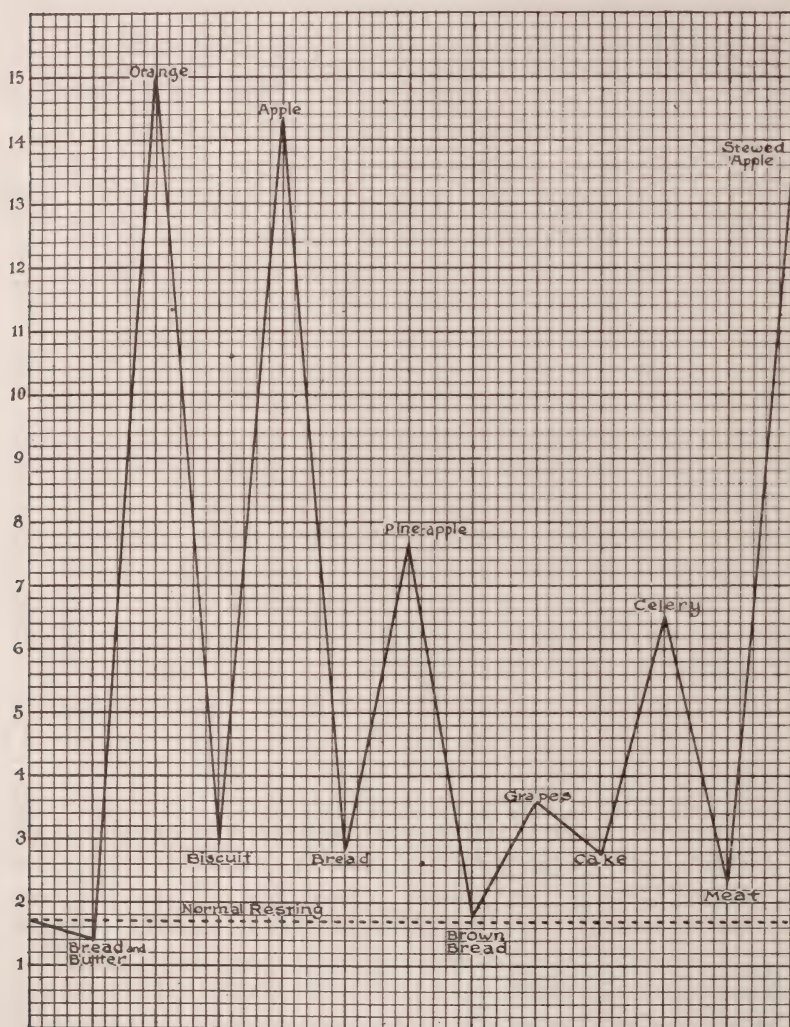


Fig. 1.—Variation in alkalinity index (amount and alkalinity per minute) of saliva during the mastication of different articles of diet.

Alkalinity=c.cm. $\frac{N}{50}$ NaOH.

Indicator=Methyl orange.

ferences in food produce enormous differences in the character of the juice secreted. The afferent nerves are the lingual and glosso-pharyngeal nerves in the tongue, and the ultimate efferent nerves are the chorda tympani and the auriculotemporal. This arc is (or should be) maintained in a state of great sensitiveness and re-

sponds almost immediately to stimulation or depression of the nerve endings in the mouth (Fig. 8). The majority of work done in the past, such as the now classical researches of Haidenhain, and Langley are unfortunately unavailable to us because we do not possess the key which will translate them into terms of ordinary everyday usage. I mean the experiments were

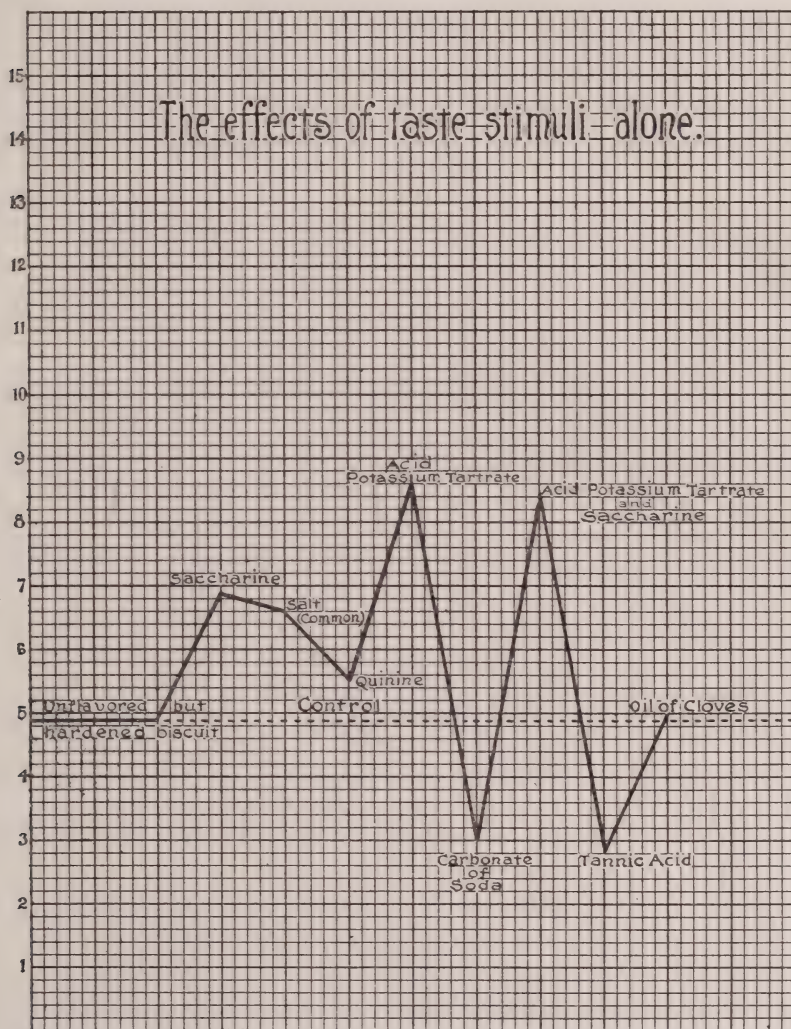


Fig. 2.—Variations in salivary secretion (alkalinity index) due to gustatory stimulation alone. Variations due to physical consistency being eliminated.

done on animals by electrical stimulation of the chorda tympani and sympathetic nerves, and what such stimulation corresponds to ordinarily we, of course, have no means of knowing.

Sellheim has used a reflex method with dogs; Carlson and Crittenden have used a similar method in the human being, but in these experiments both the substance used and the manner of stimulation

were distinctly abnormal. The following results were obtained from the human subject under normal conditions with ordinary dietetic articles.

Fig. 1 records the amount and alkalinity per minute (alkalinity index) of the saliva when various foods are being eaten, and it illustrates the very marked variations which occur normally, and how this secretion may be permanently either excited or depressed by a habitual consumption of certain articles of diet. It is obvious that those substances which are most stimulating to the gustatory nerves produce the greatest alkalinity index, and of these organic acids are the most powerful, especially when combined with a certain amount of sugar as in certain fruits. On the other hand,

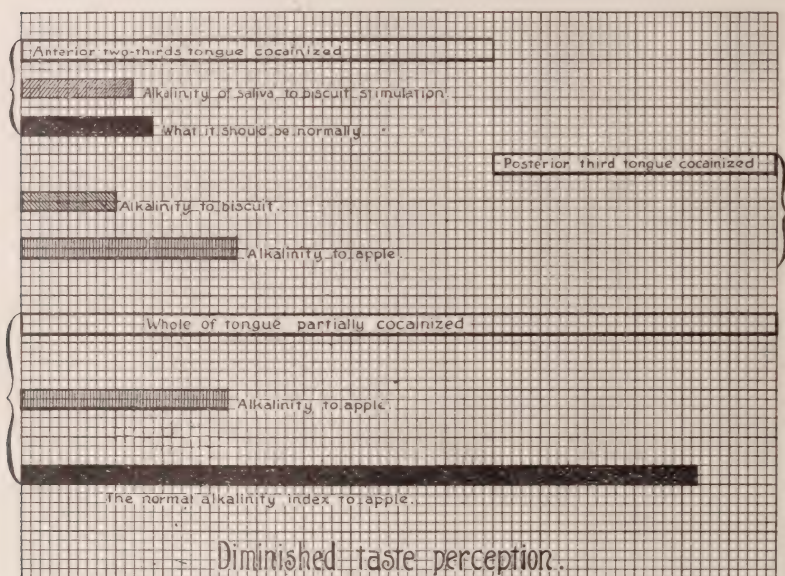


Fig. 3.—Variation (diminution) of salivary secretion due to dulling of the afferent nerve-endings.

demulcents like butter, and substances of little stimulating power, like bread and biscuit, either produce a very feeble flow, or cause it to be actually subnormal.

Fig. 2 is an abbreviated record of the alkalinity index obtained in response to masticating biscuits soaked in various solutions and dried. The results are much the same as before, but it is necessary to point out the *depression caused by the alkali and tannic acid biscuit* and the negligible effect of an aromatic.

That the 'glossopharyngeal-chorda' reflex is in the main responsible for this variation is proved by painting the tongue with cocaine and thus eliminating or dulling the reception of the impulses, when the salivary secretion falls off in a most marked manner (Fig. 3).

Beverages have an important effect also upon secretion; this is briefly indicated in Fig. 4.

Ptyalin.—I have previously stated elsewhere* that I believed the chief function of this enzyme was protective to the mouth—that its rôle is to do that which no other substance could—namely, to convert in the mouth insoluble and adhesive starch into soluble and

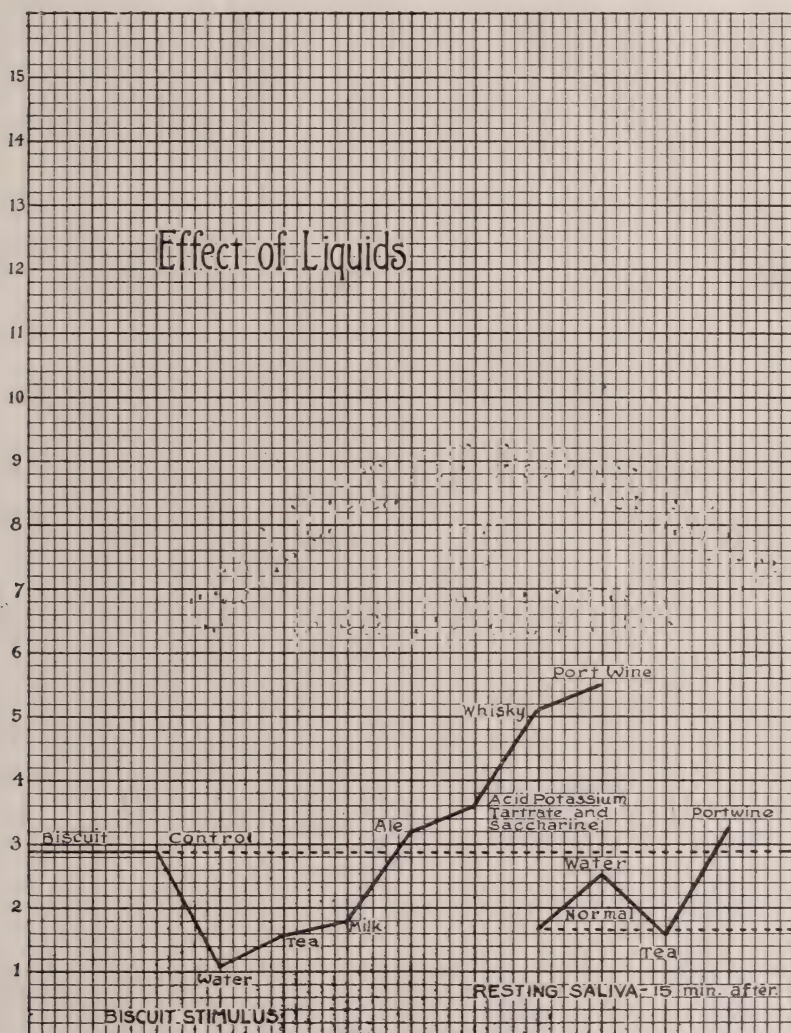


Fig. 4.—Variations in salivary secretion during the mastication of plain unsweetened biscuits but after drinking small quantities of various liquids. The lasting depression caused by tea is noticeable.

easily removed maltose. Thus the pabulum available for conversion into lactic acid (which would destroy the enamel of the teeth) is or should be reduced to vanishing point. Fig. 5 illustrates the very considerable variations occurring in this constituent and

*Op. Cit.

shows the advantage of acids and the disadvantage of alkalies and demulcents; it will be noticed that salt is very effective.

Animals apparently can digest starch just as well without their salivary glands as with them. I have excised the salivary glands (including the orbital salivary glands) from rabbits, and found that the undigested starch in the feces was not increased at all. Pavlov has, however, suggested that the reason why gastric secretion does not start for five minutes after food reaches the stomach is to allow a certain amount of starch conversion to take place. It might be thought that very little sugar would be formed in so short a time; from experiments which I have recently carried out

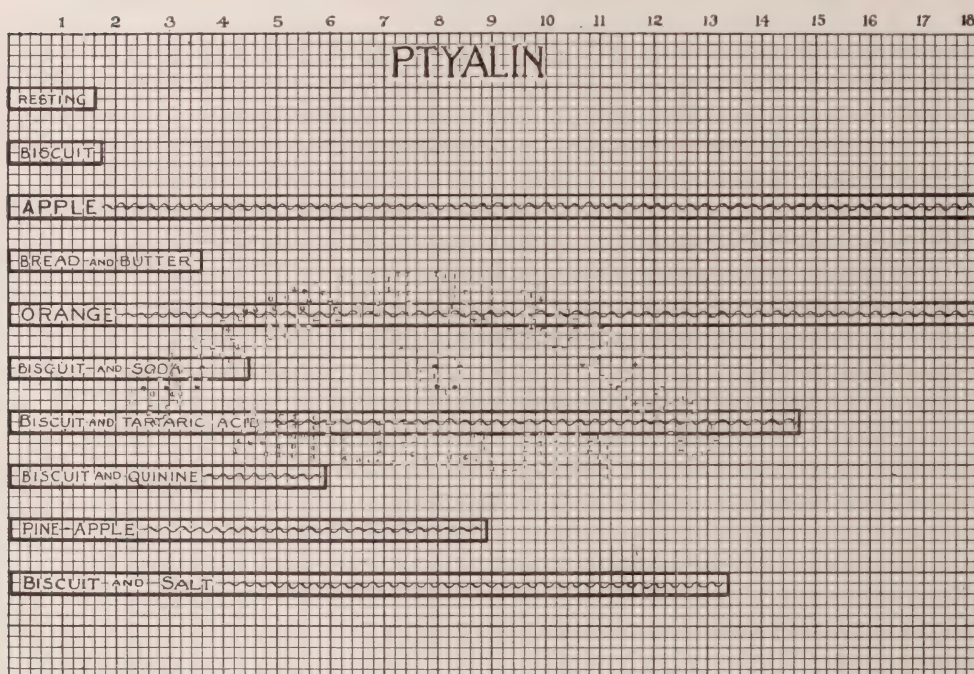


Fig. 5.—Variations in the ptyalin index of saliva during the mastication of various substances. (Estimation by Metts tubes.)

I find that 8.9 per cent. of the starch eaten may be converted in the first five minutes into maltose. Cannon has suggested that salivary digestion continues in the stomach for forty minutes or until the contents become sufficiently acid to destroy the ptyalin. I found that in masticated biscuit to which a .2 per cent. solution of HCl was added (in proportionate amount to what would occur normally after the first five minutes) 21.5 per cent. of the starch was converted into maltose in forty minutes.

It is of interest and importance also to note that these experiments show that the amount of starch thus digested is increased from 8.9 per cent. to 11.6 per cent. in the first five minutes if some

acid fruit be eaten previously to the biscuit—due of course to the subsequent rise in the ptyalin index.

Of the other constituents of saliva—phosphates, chlorides, and mucin—I do not propose to say anything except that in a general way they all follow the same law of increase to sapid substances. Sulphocyanides (which exert an anti-fermentive effect) however are not increased in percentage, but vary directly with the flow. In effect, all these substances have a direct protective action upon the oral tissues and the teeth in particular.

Summing up therefore we may say:—

I. That the salivary secretion is controlled entirely by reflex stimulation derived from the mouth.

II. That the more sapid articles and of these the acid-sweet substances give rise to the greatest secretion of water, salts and enzyme.

The effect of increased salivary flow is, therefore, to prevent oral stasis in the mouth, to promote the digestion of starch to a limited extent, to prevent lactic acid fermentation in the mouth, and (as I believe) to aid in the post-eruptive hardening of enamel, by impregnation of the outer strata of enamel with lime salts.

Gastric Secretion.—Here I propose to summarize somewhat briefly the work of Pavlov, Starling, Edkins, Lobasov,* and others in relation to the gastric secretion as observed experimentally in dogs—work which is probably quite well ‘known of’ but, I venture to suggest, not sufficiently recognized and acted upon in practice. In order to eliminate any stimuli other than those caused by the presence of foods in the stomach, a Pavlov’s miniature stomach and a gastrostomy are prepared in the animal, the various foodstuffs introduced directly into the stomach without attracting the dog’s attention, and the secretion collected from the miniature stomach which is about one-twelfth of the normal stomach.

There are two somewhat surprising results, first the entire absence of secretion to some articles of common daily consumption, and secondly the remarkable *similarity* of response to given stimuli between the gastric and the salivary glands. The following table illustrates the observed effects:—

<i>Substance introduced.</i>	<i>Amount of gastric secretion.</i>
Bread.	Nil.
Water.	{ Some (Pavlov). None (Edkins).
Sodium bicarbonate.	Complete inhibition.
Acids.	Increase, especially after meals (Starling).
Phosphoric } Butyric }	Increase.
Hydrochloric.	No more than from water.
Sodium chloride.	No more than from water.
Saliva.	Definite increase (Pavlov).
Egg white.	None for over an hour.
Minced meat.	Considerable secretion.
Fats.	Depress for 3-4 hours.

*For a detailed account of these researches see Pavlov’s “The Work of the Digestive Glands,” 2nd edition; and Starling’s “Recent Advances in the Physiology of Digestion.”

Tested in this manner we see that (contrary to the usual 'Materia Medica' statements) gastric secretion is stimulated by acids and inhibited by alkalies, and that in this respect it is quite analogous to salivary secretion; further such articles as bread, water, and fats are depressants of secretion in the second digestive cavity, just as they were found to be in the first.

Pancreatic secretion when tested by similar experiments gives precisely similar results. The animal has a pancreatic fistula and a gastrostomy, food is introduced directly into the stomach, and the pancreatic secretion observed. The following table illustrates the effects on the secretion produced by various substances:—

<i>Substance introduced into stomach.</i>	<i>Effect on pancreatic secretion.</i>
Water.....	{ Nil in 30 minutes (Dolinski) 9.4 c.cm. (average) thirty minutes (Becker).
Acids	
Hydrochloric	{ 30-40 c.cm. in 30 minutes.
Phosphoric	
Citric	
Acetic	
Alkalies	{ Decrease passing to complete inhibition.
Sodium carbonate	
Lime water	
Sugars	{ Only caused secretion when they had been given a strong acid reaction. If they were neutral or alkaline no secretion re- sulted.
Egg white	
Peptone	
Fats.....	{ Marked secretion from the action of se- cretion formed.

Again the outstanding feature is stimulation by acids and depression by alkalies. It is well known that an acid is necessary to combine with prosecretin to form the hormone which is one of the chief stimulants to pancreatic secretions; if, however, foods are taken which neither stimulate oral nor gastric secretion, and which, therefore, are not acid in themselves, the pancreatic secretion will also fail for want of hydrochloric acid to form secretion.

Biliary secretion by the liver cells is almost analogous to the foregoing, as may be seen in the following table:—

<i>Substance introduced into stomach.</i>	<i>Biliary secretion.</i>
Purely carbohydrate diet.....	'Insignificant.'
Acids.....	'Increased' secretion.
Meat diet.....	Increase of secretion.
Fat.....	Less secretion.

The bile may be secreted but not discharged from the gall-bladder into the duodenum; this has been found to be best promoted by the stimulus derived from the products of active gastric digestion. So again we see that if gastric digestion be feeble (bread, water, alkalies, etc.) the biliary discharge also will be impaired. It is, therefore, clear that with regard to these *four primary digestive secretions—salivary, gastric, pancreatic, and biliary—that in general terms their stimulants and depressants are identical in nature.*

Reflex Secretions.—Digestion as a whole is not so absolutely simple a matter as might be inferred from the above experimental results. To a very large extent gastric, pancreatic, and biliary secretions are dependent, just as is the salivary secretion, upon the integrity and sensitiveness of a reflex arc, and the one-half of the arc is, I believe, the same for all.

Pavlov, Lobasov, and others have shown the great importance of 'appetite' or 'psychic influence' on the digestive secretion. Now I think that although the eyes and ears and nose may to a certain

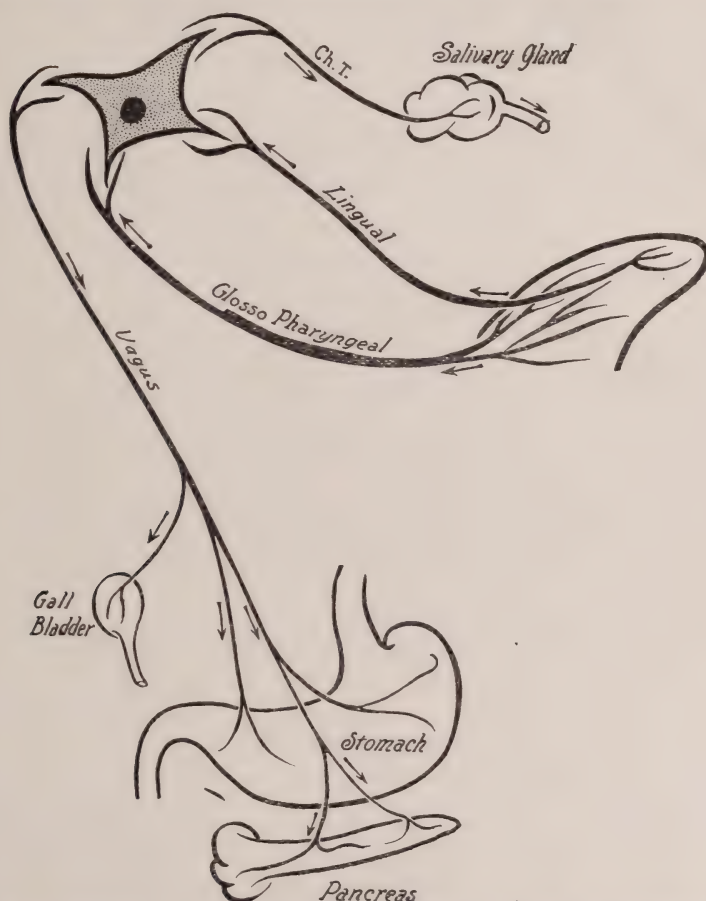


Fig. 6.—Schematic representation of alimentary reflex innervation.

extent act as receptors of stimuli to the digestive glands, yet the nerves of taste must certainly play the major part in this rôle; and it is probable that the part played by the other special senses is merely secondary to the education and previous experience of the glossopharyngeal and lingual nerves. The efferent part of the path is represented by the vagi which are secretory both to stomach and pancreas, and motor to the former and gall-bladder.

The accompanying diagram represents the paths of action (Fig. 6). If the function of any part of this path be interfered

with, there will be a corresponding loss of the alimentary secretions. I have already referred to the fact that only a partial elimination of the terminations of the glossopharyngeal and lingual nerves in the tongue by cocaine can be shown to be followed by a marked diminution in salivary secretion, and I have at present some experiments commenced of a similar nature with respect to gastric secretion. Pavlov and Lobasov have both shown that the amount of gastric secretion shows a very considerable increase when the food is masticated in a normal manner, and some experiments by Lobasov are particularly eloquent in this respect. Dogs having been esophagotomized and gastrostomized were the subjects of the following experiments:—

1. The secretion from a miniature stomach was observed (a) when flesh was introduced directly into the stomach, *i. e.*, elimination of glossopharyngeal reflex and (b) when the dog ate flesh but it passed out at the neck, *i. e.*, glossopharyngeal reflex alone acting.

<i>Gastric secretion.</i>		
	Flesh introduced into stomach	Sham feeding alone
Amount in one hour	5.0 c.cm.	7.7 c.cm.
Digestive power*	2.5	6.4

*Estimated by mm. of egg-white liquefaction in Metts tubes.

2. In this experiment a known amount of food was introduced on a string directly into the stomach and withdrawn after a certain time when the amount digested could be estimated.

<i>One hundred grams of flesh introduced directly into the stomach.</i>		
	A Without sham feeding= <i>no</i> glossopharyngeal reflex.	B With sham feeding= <i>glos-</i> sopharyngeal reflex ac- tive for 8 minutes only.
Amount digested		
In 2 hours	6.5 per cent.	31.6 per cent.
In 5 hours	58.0 per cent.	85.0 per cent.

From these experiments the considerable advantage to gastric digestion to be derived from an active glossopharyngeal reflex—from the active mastication of a sapid substance—must be quite obvious.

Reflex Pancreatic Secretion.—Although it has been widely accepted that the pancreas secretes at the bidding of a hormone manufactured in the duodenum and reaching it by the blood-stream, there is undoubtedly an important secretion which is reflex in origin, and which similarly to the salivary and gastric flow is dependent upon a glossopharyngeal reception.

It has been repeatedly pointed out that the first drop of gastric

juice never appears before five minutes after the eating of food in an esophagotomized animal, therefore there can be no hormone produced under this time; if, however, an animal has a pancreatic fistula, secretion may be seen to start therefrom in from one and one-half to two minutes after commencing a 'sham meal.' Obviously this then must be nervous in origin and the only nerves actually stimulated by the food are those of taste in the mouth.

Wertheimer and Fleig have shown, too, that acid introduced into a loop of intestine with divided blood-vessels produces pancreatic secretion; and the obvious inference is that the stimulus is a nervous one, though it has been suggested that possibly the hormone is absorbed and transmitted via lymphatics which might not have been divided.

Pathological Results and Diminished Secretions.—Complete blocking of this 'oral-abdominal' or 'glossopharyngeal-vagus' reflex arc may be illustrated by division of the vagi below the heart. When this is done, it is found that the stomach dilates, the food remains in the stomach undigested, it ferments and decomposes there and the animal dies of sapremia. I believe that a similar though milder but more prolonged effect is produced clinically in the human subject by the partial blocking of the afferent side of the arc—at its point of origin. This blocking or diminished taste perception is brought about in two ways, but both are intimately associated: First, by a habitual diet of a non-stimulating character, and secondly, by the formation of a coating on the surface of the tongue which protects or buries the terminations of the glossopharyngeal and lingual nerves, and prevents their being stimulated as they should be by food in the mouth.

Results of a Diet of a Non-Stimulating Character.—From the foregoing remarks it is obvious that alkalies may be taken as examples of non-stimulating if not absolutely inhibitory substances. To test the effect of continual depression of the secretions by this means, I have been feeding rabbits now for some three or four years on boiled and neutralized food (Na_2CO_3 being used). The results are remarkable, and, so far as I know, have not before been observed. The series of experiments is not complete, and I am unable here to give all the details; it will suffice for the present purpose to summarize the effects, which are as follow:—

- (1) If such feeding be commenced early enough in life, the animal always dies within six months.
- (2) Development is markedly retarded, the animals only being from $\frac{1}{4}$ to $\frac{1}{2}$ the weight of the controls of similar age.
- (3) Starch and calcium are excreted in excess in the feces.
- (4) The salivary glands do not develop in the normal ratio to the rest of the body (lack of taste reflex).

(5) The animals develop a polyneuritis of which they apparently die.*

(6) Post-mortem there are practically always gastric lesions, sometimes ulcers, sometimes acute general gastritis; always marked dilatation, and sometimes pyloric stenosis.

The foregoing forms a clinical picture which I believe corresponds

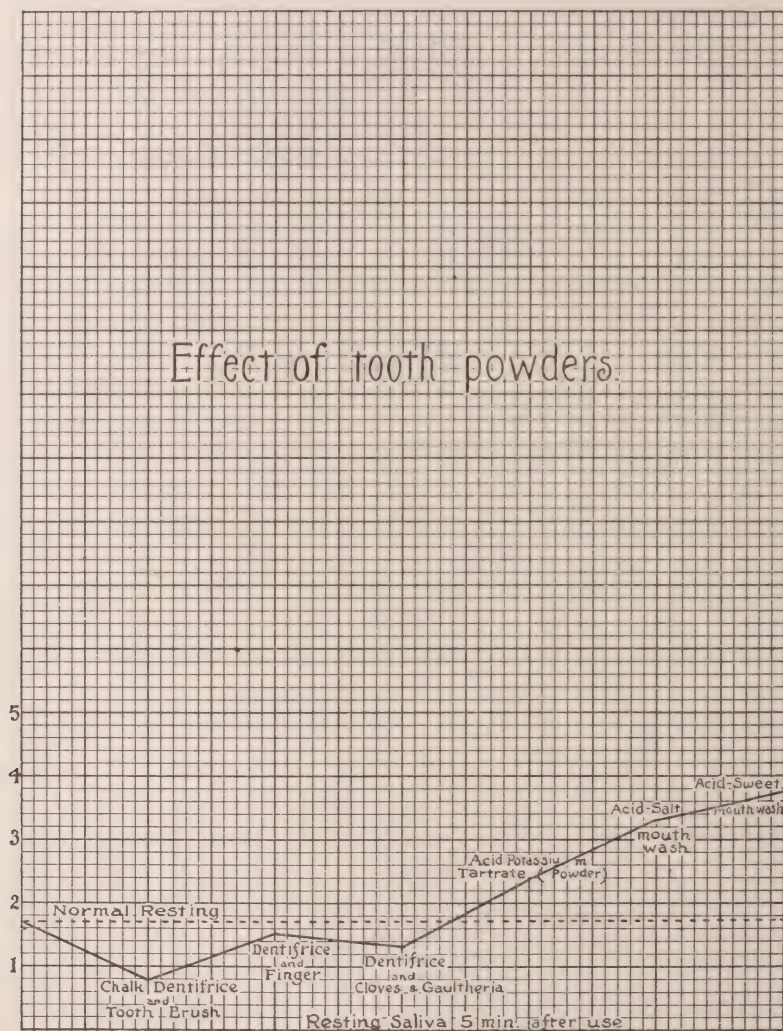


Fig. 7.—Variations in salivary secretion due to the use of dentifrices. Depression of the glossopharyngeal and lingual nerve-endings by alkaline powders.

to the chronic form of a 'disease' of which division of the vagi represents the acute form.

These results are, I believe, significant in view of the large con-

*It has recently been shown by Cooper (*Biochemical Journal*, p. 272, May, 1913) that alkalis destroy at least 50 per cent. of the activity of certain antineuritic substances which are curative for beri-beri.

sumption of alkalis at the present day, both in the form of drugs and in food. There exists, I think, a very serious alkali drug habit; people dose themselves with bismuth and sodium carbonates almost *ad libitum* for 'indigestion'; the amount of alkali in the form of tooth powders and pastes partially consumed and used locally to the depression of the oral nerve endings, must be prodigious; and the amount of sodium carbonate consumed in food and drink must likewise be very considerable indeed (Fig. 7).

Let us now turn back to the second factor in the initial blocking of the normal oral reflexes—the presence of a coating fur upon the tongue.

Fur is really salivary deposit, and is composed of mucin, epithelial cells and masses of organisms, and is identical with the deposit found around the necks of teeth. The condition is promoted



Fig. 8.

by a viscid, scanty saliva following previous irritation of the mouth by excess of such things as alcohol, tobacco, sugar, or by the over-indulgence in salivary depressants, such as tea containing too much tannic acid, bread and butter, and alkalis. But more important still, it may in addition be produced, I believe, through the *action of the sympathetic nervous system* in the following manner.

We have seen that diminished stimulation of the glossopharyngeal-chorda-vagus reflex is followed by a diminution in salivary, gastric and pancreatic secretions; this means increased stasis which means increased proliferation of organisms with the almost certain production of toxins and their absorption. Now I think there is considerable reason clinically for thinking that these toxins, or at least the endotoxins produced, have a definite effect upon the sympathetic or autogenous nerve system.

I have recently tested the effect on rabbits of the injection of endotoxins prepared from human mouth organisms, and I find that they produce a definite, though not great, rise in blood-pressure probably through vaso-constriction, since the rapidity and intensity of the heart beat was not increased. This points to sympathetic stimulation. If this be so, then we have the whole train of symptoms associated with severe oral sepsis and alimentary toxemia explained. The cold extremities, the pale, grey complexion, the headache, the constipation (due to intestinal dilatation), the anorexia due to gastric stases and fermentation and furred tongue, the latter being produced secondarily by the effect of sympathetic stimulation on the salivary glands, which, as is well known, is to cause the flow of a very scanty and viscid saliva of high specific gravity.

I have also found that by giving rabbits daily, by the mouth, 1 c.cm. of a broth culture from carious teeth, all the symptoms of oral sepsis and intestinal stasis were produced (as far as one could judge in an animal); at least the symptoms of malaise, anorexia, and diminished defecation were most marked.

Thus we have produced an extremely strong vicious circle.

Diminished oral stimulation produces oral stasis and sepsis initially, this in turn producing gastric and intestinal sepsis, thus giving rise to toxins which being absorbed still further increase oral sepsis and diminished taste perception and cause intestinal dilatation which again increases toxic absorption. And so the cycle goes on getting stronger and stronger until the patient's alimentary system can no longer resist the strain or perform its function. All of which things point eloquently in one direction—the desirability, nay the necessity, of maintaining the glossopharyngeal-chorda tympani-vagi reflexes in an active and sensitive condition if the health of the alimentary tract is to be maintained.

How this may best be accomplished is evident from the results of the experiments referred to above, the chief indications being obviously the more liberal use of organic acids in such strength that they produce a normal and maximum response, and neither fail to stimulate on account of weakness nor paralyze nerve endings by being too strong.

PSYCHOLOGICAL FACTORS IN MEDICAL PRACTICE.*

By SHEPHERD IVORY FRANZ, Ph. D., of Washington, D. C.,

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The past hundred years have brought about great advances in the understanding of the body and its diseases. The extension of animal experimentation in the laboratories of physiology and pharmacology has given us a clearer insight into the methods of the working of the body and into the action of drugs upon the different bodily mechanisms. The methods of organic chemistry have been utilized to investigate the more abstruse problems of normal and abnormal metabolism, and to discover the compositions and methods of formation of the fluids and secretions of the body. From a different angle, pathological anatomy and bacteriology have worked together to shed great light upon the etiology of many diseases; they have materially changed our conceptions of some of them, and in conjunction with chemistry have given us means of preventing or of successfully combating others. Owing chiefly to the brilliant discoveries in the anatomical sciences, such as those of Virchow and his co-workers, medical men gradually gave up what may be termed the spiritual view of disease and easily assumed the materialistic attitude, which is still retained to-day by most physicians either in a gross or in an attenuated form.

In other subjects the spirit of inquiry, of doubt, and of investigation was also working. Among them, philosophy, at the same time the most fundamental and the least practical of the divisions of knowledge, did not escape the general catalytic action, and, principally because of the work of Lotze, of Helmholtz, and of Wundt, psychology was soon set free from the complex mixture of philosophy. Although medically trained men were thus largely responsible for this separation and independence of psychology from philosophy, medical men as a whole have paid no attention to the new science. A few, who happened to be interested in the abnormal mental processes of the insane or in other mental phenomena such as those in hypnotism, did study the mind and made use of the facts gathered in the new science. On the whole, however, physicians were shy of, not to say antagonistic to, the work, either because they believed it still to be a part of philosophy, which is given up to unpractical speculation, or because they believed that the full secrets of disease would be discovered by examining tissues and cultures through a microscope.

*Read before the St. Louis Medical Society, November 15th, 1913.

On the other hand, those who did dare to dip into the accounts of psychological researches must have felt the apparent futility of much that was accomplished, and must also have felt that the new psychology was far from touching the problems of daily life with which they themselves were concerned. Although this far-from-daily-life standpoint has often been taken as a matter for reproach of psychology and psychologists, it must be remembered that, as far as medicine is concerned, there was no opportunity for the psychologist to show what he could do either towards the analysis of disease or towards elucidating the mental factors of importance in the treatment of the sick. Moreover, in thus judging psychology from his own practical standpoint and in demanding that psychology should furnish practical principles and precepts, as has been done even in the past few years, the physician demands what he dares not demand from the well-recognized medical sciences, such as anatomy and physiology. No one assumes, or demands, that the physiologist, for example, shall lay aside the investigation of the fundamentals to take up the daily problems of the hospital wards, or even that he shall publish his work in such a manner that all, even though untrained in his field, may read, understand and profit therefrom. The practical applications are left to those who are practising physiologists, the physicians, for the latter come in direct contact with those who are ill. Only they have the opportunities, for example, to apply to patients with heart diseases the laboratory facts of sphygmomanometry or of bodily electromotive changes. It is apparently understood that the gastro-enterologist is the one who must determine whether or not the *x*-ray examination of the cat's stomach and intestines gives either method or result of value for the understanding of the disturbances of gastro-intestinal motility in man. The division of duties and responsibilities between the scientist and the practical man, or between the scientific subjects and the practical ones, has held in medicine just as in engineering or in tariff-making; but even to-day medical writers do not hesitate to condemn psychology for its searching out of those things which, they believe, are not directly applicable to the practical problems of daily life. It is, I think, largely because of this negativistic attitude of the world of physicians towards psychology that they and their patients have not profited as much as they should from the accumulation of psychological facts, and that charletans have been able to flourish, to treat, and, let us say it in a whisper, to cure, many whom the regular physicians have been unable to benefit.

The success of Christian scientists, of faith healers, and of the devotees of other similar cults has been largely due to the fact that the importance of the psychological factors in disease has been taken into account. There is no evidence that these mental factors have been consciously understood or properly evaluated by these irregular practitioners, but that they have been made use of in their business there can be no doubt.

Before beginning to take up in detail the psychological factors in the practice of medicine, it may be well to define in a brief fashion what constitutes psychology; and also to consider what is the chief function of the physician in the practice of medicine. Psychology has been defined as 'the science of mind,' or the 'science of consciousness,' or the study of mental conditions and processes, their modes of occurrence and their interrelations. According to these definitions, and in accordance with the accepted delimitation of the field of psychology from those of philosophy, physiology and psychiatry, the objects with which psychology deals may be briefly scheduled as sensations, perceptions, imaginations, emotions, volitions, and the like. His own perceptions, imaginations and emotions an individual may observe, but those of another he cannot directly be conscious of. It is, however, possible to deduce the mental states of another by observing his actions, for every mental state or process has associated with it some type of motor response. For the understanding of the mental state of another, one must observe the other's conduct and must translate the activities of which he becomes conscious into terms of his own feelings, sensations and so forth. The activities which accompany mental processes may be very simple or very complex; they may be as simple as the winking of the eye, or even more complex than the combined action of the diaphragm, abdominal muscles, the thoracic muscles, the larynx, the tongue, and the lips in the process of phonation.

What may we say is the chief function of the physician? It is, the writer thinks, quite generally admitted that the whole of medical science has for its aims, first the discovery and the prevention of abnormal functioning and, secondly, the production of normal function or the amelioration of function in diseased individuals. In his practice the physician is interested chiefly in the latter; he finds in his patients symptoms of disordered functions, and he is concerned with the possibility of changing the diseased conditions into those of proper or more normal functioning. A knowledge of pathology is a valuable asset; an understanding of etiology and of the appropriate measures to be taken to prevent the spread of the various diseases is essential if the physician is to carry out his proper relations to the community; and the ability to make an exact and true diagnosis is necessary for the understanding of his patient's needs; but, as far as the relation of the physician to the individual sufferer is concerned, all this knowledge satisfies only scientific curiosity, it is but 'sounding brass and tinkling cymbals' if it be not associated with that other knowledge which will enable him to help his patient to, or to bring about, a more normal condition of function. The discovery of a new disease and the demonstration of its etiology and pathology are parts of the science of medicine. Either of these may bring the physician lasting fame, but it is of no practical value that a correct diagnosis be made, if this diagnosis be translatable solely into what corresponds to the judge's

sentence of the convicted murderer. It is of no practical value that the appearances of the cells of the liver, or of the brain, or of the heart be correctly described if the knowledge does not lead to the relief of sufferers.

Taking a general view of scientific medical facts, we find that some are important in diagnosis, but of no benefit for the relief of patients; others are of interest as anatomical or pathological or physiological facts, but are not directly applicable to the restoration or amelioration of function. It would be folly to deny that these facts may be beneficial to future patients, and to limit the accumulation of medical facts to those of immediate application would bring about another period in medicine similar to the Dark Ages. Moreover, to limit the teaching of anatomy, physiology, pathology, bacteriology and other fundamental medical sciences to those facts of known application would not only retard the progress of medicine, but would tend further to enlarge the angle between those who seek to advance medicine and those who apply the precepts with which they are furnished.

On the other hand, as has been pointed out above, these are the general attitudes of medical men towards psychology. During the past few years a small number has been urging a closer union between psychology and medicine, but many still deny the medical value of psychology. They have denied its possible value, because it is a science and not an art, but this is not different from their attitude towards some of the recognized medical sciences twenty-five years ago. As far as the writer has been able to analyze the objections, there is one element common to all. This is the feeling that psychology has failed to furnish practical working equations for use in medical practice. What appears to be demanded is a supply of ready-made equations, such as: A cretin + thyroid extract = a normal child.

In the minds of many there is great doubt that normal psychology will ever be able to supply similar equations to the medical profession for its guidance, but that there are equally important facts and principles which the study of mental phenomena will bring forth no physician should doubt.

I have previously said that a few physicians are beginning to appreciate some of the mental factors in the practice of medicine. About a month ago I was agreeably surprised to receive a magazine which among other things contained articles by two well-known surgeons who emphasized this aspect of medicine. In this journal Mumford describes the case of a man who in former days would have been dealt with purely from a materialistic drug-dosing side, with results which would not have been entirely encouraging, because, in the absence of a cure by these methods, he would have been passed to that scrap-basket of medically undiagnosed cases, chronic invalidism. This patient sought advice and treatment because of an incapacity for work, which was believed to be due to some form

of heart insufficiency. Upon examination it was found that there were a slight and mild form of heart disease and a slight kidney disorder, which because of their minor character could not explain the great change in the patient's capability for work. A more extended examination and a more careful consideration than the usual physician gives to such a patient revealed the fact that the heart and kidney abnormalities were attendants of certain mental phenomena. It is possible that in this case the physical difficulties brought about the mental, and that in turn the mental affected the physical capabilities of the patient. It is also possible that there was a primary mental disturbance or deviation from the normal which affected the heart and indirectly brought about the kidney complication. Whichever view one cares to take makes little practical difference, since the treatment, if the physician appreciates the possible psychological factors, is apt to be the same. The mental factors are elements in the pathogenesis. Here they were not obvious symptoms, but elements of the disease which had to be determined just as much as the area of cardiac dulness and the urinary casts. In the cases of this character, which I cannot believe are uncommon in practice, Mumford remarks that it "does not suffice to treat the crippled heart by rest, by drugs, by Nauheim baths; but spiritual, psychical encouragement must be secured in some way."

In the same number of the same magazine Crile more emphatically asserts that the mind may cause diseases other than the mental. He points out that emotional conditions may bring about, or may be accompanied by, variations in the composition of the secretions of the body and that the activities of the organism may be greatly affected by them. Among other things, he states that with emotions there is an increase in the secretion of the adrenals, of the thyroid and of glycogen, which is accompanied by an increase in the power of the muscles to oxidize the glycogen. With these changes in the regular course of bodily activity are found "accelerated circulation and respiration with increased temperature." He also mentions as an accompaniment of emotions a change in the composition of saliva which may result in a subsequent pyorrhea alveolaris. Crile goes farther and acknowledges his belief in the principle of 'mental causation' of physical diseases, a principle which few, if any, of our professional psychologists dare to advocate publicly. In his own words: "Chronic emotional stimulation may fatigue or exhaust the brain and may cause cardiovascular disease, indigestion, Graves' disease, diabetes and insanity." Probably no stronger expression of the belief in the importance of the psychological factors in the causation of mental disease can be adduced than this one of Crile, in which the mental factor is taken as the exciting cause of a number of bodily diseases.

Under what conditions or for what reasons do patients consult their physicians? The answer that would probably be given by all

of you is "because of diseases." If each of you were asked to define what you meant by your answer, and to find some common ground or common factor on account of the variations in connotation of the term disease, you would come to an agreement which would exclude that particular term. I think you would be forced to come to the conclusion that patients consult their physicians for one reason. This reason is that the patients have mental experiences different from those to which they have been accustomed. The individual consults the physician or surgeon solely because he feels general or localized pain, or discomfort, or malaise or the like. Take the case of the patient who consults you because of pains in the anterior part of the thigh. In order properly to bring about a more normal condition of function, you, as a physician, need to know that this abnormal feeling may be due to disease of the ovary or of the uterus, as well as to neuritis. But, your patient consults you not because of the pathological lesions—of these he or she is usually ignorant—but solely because of the pain sensations which he or she experiences. Another patient calls upon you because he cannot hear as well as usual, or because of a peculiar buzzing sound, more or less constant, which impinges upon his consciousness. The object of this patient in consulting you is that he may have restored to him his normal degree of hearing, or that he may be relieved of the abnormal sensations which he is experiencing, so that he may properly carry on his business or his social affairs. Except in an incidental way he is not much interested in the cause of the abnormality. As a physician, you must know that tinnitus aurium may be produced by a variety of abnormal conditions of the body, that it may be a symptom of irritation of the meatus of the ear, or of inflammation of the Eustachian tube or middle ear, or of cerebral syphilis or meningitis, or of neurasthenia.

A consideration of each and every one of your patients will reveal the predominance of this mental factor; the patient suffers discomfort and consults you because of his unusual or abnormal psychological states. So long as pathological lesions produce no disturbance of the mind, such as discomfort or mental difficulty, your prescription and advice are not sought, but when the ache, or suffering, or fear, or malaise, or anxiety becomes great enough, then your skill and knowledge are invoked. Nor need we make exception of those cases in which the patient does not personally visit you or seek your treatment, such as the insane and young children. Here, the mental pain or anguish or other unusual mental state may be in the parent or wife or guardian, and he or she asks your advice and treatment for the other who may not directly appreciate the necessity for your remedies.

These psychological factors which cause the patient to seek your aid are but the beginning of a train of others which you must consider throughout your treatment and care. In diagnosis they are sometimes the only things furnished to you. In some forms of

mental disease the physical, neurological, clinico-pathological and serological examinations reveal no deviation from the normal, but even in the absence of physical symptoms the patient is incapacitated for his work, or his daily social duties. He hears voices, calling him vile names, or commanding him to do various things; he believes people keep a watch over him, spying upon his every action; that they prevent his accomplishing what he should do; that some unseen force is exerting an evil influence upon him. Depending upon the relative power of these peculiar ideas, such an individual may shut himself off from the rest of the world, or may set forth to attack his supposed defamers or enemies, and at the same time he may feel greatly depressed or highly exalted, respectively because of his self-supposed incapacity or his great abilities. Or consider the conditions exhibited by those with various phobias or with exaggerated doubts. One individual fears dirt, another fire, a third fears red, a fourth open places. Still others doubt that they have locked the front door, or the office safe, or that they have properly washed themselves, or that they have said the proper things in their business or social relations. They go blocks out of their way in order that they may not see a burning building, or to escape a crowd, or to avoid crossing a park. Others go to the front door and windows to test them, go to bed, but are again troubled by doubts of the accuracy of their performance, get up again to see if the door has been properly locked, and continue in this manner until exhaustion brings sleep. In such patients, the mental signs are the only symptoms; we may say they are the diseases.

But, you may ask, are there any so-called physical diseases in which the mental signs are of such importance for diagnosis? The answer to this question must be a strong affirmative. An extremely interesting case of this character has been described by Dieulafoy. In this patient pain alone led to the correct diagnosis of perforation of a simple ulcer of the stomach and superacute peritonitis, without there having been any previous history of gastric involvement. The patient showed no increase in heart rate, there was no fever, and tympanites, vomiting and hiccough were absent. In regard to this case Dieulafoy remarks "one sign carefully examined—namely, pain, was sufficient to lead to the diagnosis." Consider one of the most common forms of functional disturbance for which the physician or surgeon is consulted—dysmenorrhea. After we separate from this large group those cases for which definite physical causes can be assigned, there remain some in which (I quote a well-known textbook of gynecology) "no evidence of pathological lesion can be discovered." The patients' sensations and feelings alone give the physician evidence of the nature of the trouble. The pain may begin before the menstrual flow, be intermittent, or severe, or the reverse of these. In these cases the diagnosis must be made by exclusion, the disturbed mental processes point clearly to a disturbance in function of the uterus and its appendages; but in the

absence of any discoverable physical causes the diagnosis of neuralgic dysmenorrhea is made. In former days this might have been well called idiopathic, because the psychological factors alone give the indication of the disturbed function. Or, for a third example, consider the symptoms in cholecystitis. While the psychological symptoms by themselves may not give the physician the right to make a differential diagnosis between this condition and other forms of gall-bladder disease, they are not of secondary importance. We read "acute paroxysmal pain usually in the right hypochondrium . . . is the earliest evidence of the disease. It is shortly followed by nausea . . . and tenderness . . . at first diffused, becoming localized, but not always, over the site of the gall-bladder." With these mental disturbances there are associated vomiting, distention of the abdomen and rigidity; but the combination of these physical symptoms are to be found in many other diseases of the abdominal organs, and is not sufficient for a differential diagnosis. If we had time many other different conditions might be cited, all showing plainly that the psychological factors in the diseases are of great importance for the purpose of correct diagnosis.

Because the physical actions of drugs are taught in the schools, and because this part of their action has been almost exclusively emphasized, we have been accustomed to think that it is the action of the drug on the diseased part that the physician seeks when he administers it to a patient. This is very far from the truth. There is no reason for the legitimate prescription of three-fourths, or even more, of the opium dispensed in this country other than that it will make the patient feel better, relieve him of pain, and enable him to obtain mental rest in sleep. Nor has the symptomatic prescription disappeared. It is not necessary to go over that field in detail, but it may be said that in the last analysis symptomatic prescription is solely the dosing of a patient with those things which will make him feel better. In dealing with this subject of therapeutics, we should not forget that the giving of a prescription has its own mental effect. The patient feels that something is being done to relieve him of his ill feeling, and the drug, if one is prescribed, is taken with faith. In dealing with the group of so-called carminatives, Wood has recently expressed himself forcibly on this point as follows: "The powerful odor leads to a belief that they are powerful remedies . . . for the superstition that the worse the taste of a remedy the more potent it is still survives to a surprising extent even among the educated. The thoughtful physician clearly apprehends that the beneficial effects of drugs are not always due merely to a direct action upon diseased organs, but that frequently a part, if not the greater part, of the good effects which they produce are the result of a patient's expectations of relief."

Moreover, it is now well understood that the administration of some drugs is followed by great mental changes, and the drugs are

given for their mental action primarily. Cocaine, ethyl chloride and other local anesthetics are employed solely for their psychological action, or, to put the matter in other terms, to bring about changes in the sensation ability of the patients. It is not as widely recognized that the knowledge of the expected effect of any drug may influence its apparent physical action. The story is frequently told of the man who swallowed something which, from the label on the bottle, he believed to be poison. Following his belief he experienced the symptoms of poisoning associated with the particular drug, and was relieved solely by discovering that his reading of the label was erroneous. This mental aspect of drug action has been little considered. Rivers, however, in his pharmacological studies of the effects of caffeine and alcohol upon bodily and mental fatigue, has shown how important it is that the experiments be freed from knowledge on the part of the subject of the drug which he is taking. In respect to the pharmacological action of alcohol, there has been very great conscious and unconscious bias on the part of experimenters, but it is now recognized that in such experiments upon man the mental factor enters to complicate any physical drug activity. Not only the therapeutic nihilists, but many others, would be willing to admit that the old time bread pill or other placebo is the most powerful therapeutic measure at hand to-day.

Not only may mental states produce diseases, not only are they the reasons why you are consulted by patients, not only do you depend in many instances upon them for your diagnoses, and not only are they important in helping or retarding the action of drugs, but the mental make-up of a patient is also of primary interest to you in all your relations with him. You may not consciously classify those who consult you into definite mental types, but to be successful in your dealings with them you must take into account the mental peculiarities of each and every one. There are those who are analysts; they observe carefully and pay almost exclusive attention to their symptoms, can give you the symptomatology of their disease more accurately than it can be found described in the textbooks of medicine. They observe slight variations from day to day, or from hour to hour. Some of them demand your presence almost constantly and think your daily visits are too infrequent in view of the gravity of their diseases. Or they may be highly imaginative, and complain of pains and discomfort and of complications which do not exist. Or they seek sympathy and exaggerate their helplessness. You also find those who feel little discomfort from disease, or they minimize their pains, fail to complain when complaint is an important indicator of the course of the disease and its treatment. Some, animal-like, would crawl away, if they could, to suffer in silence, to be far from the disturbances of solicitous friends and the demands of business. Others chafe under the neces-

sity of quiet for more than an hour at a time. They demand visits from their acquaintances, they must be read to or otherwise amused, they must have some mental excitement to counterbalance the pain of the operation or the monotony of the sick-room; they disregard, as far as they dare, every rule or order given by you for their treatment. They fret about the food, it is too little, or they are compelled to take too much. They dislike the nurse, she is too ugly or too dictatorial or too quiet or too healthful or too inattentive. Some fear, others are sanguine; some are suspicious of everything you do, others rely upon you and have also self-reliance. Some of these patients must be assured again and again of the minor character of their ailments, others, equally often, must be impressed with the gravity of their diseases. The explanation that child-bearing and childbirth are perfectly normal physiological phenomena has been the means of dispelling fear or apprehension on the part of many an expectant mother, and constantly repeated commands or urgings must be used with other women to prevent a too early resumption of their household duties after confinement. All these hypochondriacal complaints and perverse grumblings, the optimism or contentedness or indifference of your patients are psychological factors of the greatest interest to you; all must be considered by you in your treatment. With some patients you must act as an autocrat, be severe and almost harsh, if they are to be benefited, while others must be coddled, or they must be cheered, or they must be taken into your confidence and entrusted with the reasons for your orders.

But this is only half of the picture. The reverse side must also be looked at. How are your actions interpreted by your patients? What inferences do they draw and what mental effects result from your actions? When you make a snap diagnosis one believes you to be acute and proficient, another that you are incompetent. On the other hand, a complete examination impresses the great majority of patients that you are careful and are giving them the benefit of your experience and knowledge, a few become suspicious and doubt, for example, that your palpation of the colon has anything to do with the pain felt in the shoulder. Hesitancy on your part, both in forming an opinion and in prescribing, may cause you to be characterized as a fool, but more often it may lead to the belief that you are studying the case thoroughly and scientifically. Tip-toeing or 'pussy-footing' into or out of the sick-room will leave a bad impression upon a man of affairs, but will probably be liked by another, a quiet, gentle patient who seeks rest. What should be said regarding the effects of the half-mysterious conferences with other members of the family after you have left the patient is a matter which you are well able to decide. Then, there is candor, to be supplied in full strength to some patients, bringing promise of an early relief from their sufferings and to others increasing hopefulness and expected joy. Other patients need the disguised mixture, hope and cheer,

for to them "the whole truth and nothing but the truth" is a paralyzant which stops all function.

In the introduction to his textbook on insanity Mercier compares the internist and the psychiatrist with the officers of a ship. We may well compare the attitude of the physician who takes an exclusively material aspect of disease and who excludes the psychological factors with that of the internist as delineated by this author: "His position towards the patient is that of the shipwright and the engineer towards the vessel on which they are engaged." He may be thoroughly acquainted with structure and function and be able to "repair the structure and to correct the function when the one is damaged or the other is at fault; but with the ship's course he has nothing to do." The winds and the waves may retard the ship, even though the engines work with their accustomed facility; but, even though the engines be capable of working only under half-steam, favorable winds and waves will bring the vessel safely to port. It cannot be truthfully said that the influences directing the life of an individual are all external. Many mental influences act to alter the bodily functions; mental habits, modes of thought and emotions have as much, and at times more, influence upon the general well-being of the individual than many of the physical conditions.

I have already expressed the belief that much of the non-success of medical men with certain types of patients has been due to the failure to appreciate the mental aspect of diseases, and that the success of the mental healers has been due to their utilization of the mental factors in their treatment of these same diseases. I have no brief to present in favor of the non-medical mental healers. Far from it, for I believe they usually do more harm than good. But I have an indictment to present against the majority of the medical profession that they have disregarded one of the most important elements in their profession. They have as a whole taken little account of the psychological factors in their practice; they have disregarded the possible effects of the mind upon the body; and they have thus been indirectly the cause of the exploitation of many of their fellows by mind curists and others of like ilk. What may be added to this is of as great importance: the physicians of to-day should do what they can to correct or change this state of affairs, and help to have the physicians of to-morrow properly trained in these lines, that in the years to come they may be of greater benefit to their fellow men as well as more successful in their chosen profession. Some of you already appreciate the mental aspects of some of your patients, some of you have been able to help your patients because of this knowledge. But, if you have this psychological knowledge, it is because of your own innate acumen and because you are psychologically inclined. It has been said that all of us are psychologists in a practical way, in as far as we observe the actions of others and interpret them in terms of our own mental processes.

Some of us are able to interpret conduct better than others and are better psychologists, but all of us have some knowledge and we constantly make use of it in our daily dealings with our fellows. But a modicum of knowledge of mental processes and mental states is not sufficient for the physician, nor is the casually obtained knowledge all that he requires. For his own interests and for the benefit of his patients more extended knowledge of psychical conditions and events is needed by him. He will then look at his patients not as cases but as persons, not as machines but as sentient beings.

STRICTURE OF URETER SIMULATING NEPHROLITHIASIS.

By GUSTAV BAAR, M. D., of Portland, Ore.

W. G. M., male, *æ.t.* forty, traveling salesman, consulted the writer on August 10th, 1903, complaining of frequent attacks of colicky pain in the right lumbar region, radiating along the right iliac crest, into the glans penis, with tenesmus and meteorism of the abdomen. Such attacks would come frequently after riding over rough roads, after chopping wood or after any physical exercise; he would be laid up two or three times a week with intense pains which could be relieved only by morphine injections. A year ago his physician suspected a stone in the right kidney and made a kidney incision, without, however, finding any stone. The attacks continued unchanged.

Status.—Somewhat pale, middle sized, undernourished. Lungs, heart, liver, spleen: nothing abnormal. Right inguinal ring open for finger tip. Urine: 1022, slightly acid, turbid, traces of nucleo-albumin, 0.03 per cent. Esbach, excessive indican, no bile, no sugar. Sediment: excessive pus and red blood corpuscles, moderate cuboidal epithelium.

August 11th, 1903.—Sediment stained with methylene-blue shows many cocci, groups of coffee-bean shaped, intracellular diplococci, Gram negative, and some colon bacilli; Weigert stain of the sediment for tubercle bacilli negative.

August 16th.—Patient felt better all week, bowels in a better condition; did not do much riding. Urine (passed in office) 1020, turbid, alkaline, normal odor, moderate serum and nucleo-albumin, no indican, pus positive. Sediment: many pale red blood corpuscles, pus corpuscles, a few calcium oxalate crystals, no bacteria.

August 18th.—Urine: acid, moderate albumin, 0.03 per cent. Esbach, no sugar, no bile, no indican. Sediment: many red blood corpuscles (circles) and pus corpuscles, moderate cuboidal epithelium, excessive numbers of tiny and middle-sized calcium oxalate crystals, a few ureteral epithelial cells.

August 21st.—Patient reports having suffered again yesterday, from a painful attack, similar to those before described, after a forty mile ride. The pain radiated outside the right thigh. Urine (passed in office) slightly alkaline, 1021, excessive serum and nucleo-albumin, no sugar, no bile, moderate indican. Urea: 0.9. Sediment: pale circles of red blood corpuscles, many pus corpuscles, moderate epithelium from pelvis of kidney, a few calcium oxalate crystals and connective-tissue shreds.

The writer concluded that the patient suffered from oxalic acid gravel in his right kidney—a diagnosis which, as will be shown later, was wrong. He put the patient on Cantani's diet, sodium bicarbonate and lithium carbonate effervescent, and a hot bath every day.

August 29th.—Patient has felt better the past week. Urine: 1019, alkaline, marked traces of serum and nucleo-albumin, no indican, no bile, no sugar. Sediment: amorphous phosphates, pus and red blood corpuscles, no oxalates.

Repeated examinations of the urine on August 31st, September 12th and November 21st gave the same results.

Some five days ago patient had another attack of renal colic with tenesmus. One night, while trying to void urine, the stream stopped suddenly, and, after a strange sensation, as if some foreign body had passed the urethra, the flow started again.

November 21st.—Patient reports an intense attack of kidney colic in both

lumbar regions, radiating into the bladder and accompanied by vomiting. This came over him after he had walked quickly for one and one-half miles.

December 27th, 1905.—The patient states that during one of his attacks, while the writer was in Europe, a prominent surgeon diagnosed his case as appendicitis, and removed his appendix. After recovering from his appendicitis operation, he continued to suffer from the same painful attacks he had before. The writer suggested to the patient to have his kidneys catheterized. On re-examining the patient, the writer found that the shreds in the urine consisted of pus corpuscles which contained characteristic groups of gonococci. The prostatic secretion showed many pus corpuscles with gonococci.

January 6th, 1906.—After prostatic massage the patient developed a purulent urethritis, the secretion showing gonococci. The writer prescribed irrigation with potassium permanganate.

On February 14th, the sediment of the first portion of the urine, caught in a sterilized tube, showed gonococci. On February 15th, the urine taken from the bladder with sterilized catheter showed many gonococci in the sediment. The urine from the right kidney where the catheter was introduced 27 cm. high, contained, microscopically, pus cells, blood corpuscles, a few connective-tissue strands, a few cuboidal epithelial cells, many intracellular gonococci. The urine from the left kidney showed a sediment of a few red blood corpuscles, no pus corpuscles, no gonococci.

The diagnosis therefore had to be changed to the following: Pyelitis dextra gonorrhoeica, cystitis gonorrhoeica, prostatitis gonorrhoeica.

February 28th.—The writer injected 6 c.cm. of a 1 per cent. solution of nitrate of silver into the pelvis of the right kidney and 4 c.cm. into the left. The urine caught from the right side contained gonorrheal pus and was turbid; the urine from the left kidney contained no pus and only a few red blood corpuscles. At the same time the writer irrigated the patient's bladder with a solution of nitrate of silver (0.25 to 1000), and continued this latter procedure until March 6th, when he injected into the pelvis of the right kidney 25 c.cm. of a 1 per cent. nitrate of silver solution. On March 10th, he injected 20 c.cm. of a 1 per cent. nitrate of silver solution into each renal pelvis. After this procedure the patient voided two long casts of the ureters (rain-worm shaped). The urine from the right side was purulent, from the left side clear.

Up to March 19th, the irrigation of the bladder with silver nitrate was continued. On March 19th, 25 c.cm. of a 1 per cent. solution of silver nitrate was injected into the right kidney pelvis and 20 c.cm. into the left pelvis.

March 28th.—The same procedure continued, but a 2 per cent. solution of silver was used.

April 2nd.—The same procedure repeated. The urine from the right side somewhat turbid. The sediment consisted of pus corpuscles, moderate cuboidal epithelium and a few red blood corpuscles. The urine from the left side was nearly clear. The sediment consisted of ureteral epithelium, no pus corpuscles, no albumin.

April 6th.—Injections into both renal pelvises.

April 11th.—Bilateral injections as above.

April 21st.—Injections into the right pelvis of 50 c.cm. of a 2 per cent. solution of silver nitrate, without causing renal colic. Cystoscopically the writer could notice simultaneously no return flow into the bladder.

April 23rd.—40 c.cm. of a 2 per cent. solution of silver nitrate injected into the right pelvis, 10 c.cm. into the left pelvis.

April 25th.—50 c.cm. of a 2 per cent. solution of silver nitrate injected into the right pelvis.

April 30th.—40 c.cm. of a 2 per cent. solution of silver nitrate injected into the right pelvis, 10 c.cm. into the left pelvis.

May 3rd.—50 c.cm. of a 2 per cent. solution of silver nitrate injected into the right pelvis.

November 7th.—Patient has received forty injections into the right kidney pelvis. The later treatments consisted of 50 c.cm. of a 20 per cent. protargol solution. The renal colics ceased from the time of the first kidney catheterization, and up to the present time, March 3rd, 1913, have not reappeared. Inasmuch as the urine still shows pus and intracellular gonococci, we cannot speak of a *restitutio ad integrum*. But the writer may safely state that he effected a practical cure by reducing the inflammation of the ureter, thus removing an inflammatory stricture of the ureter, which was producing the clinical picture of renal colics, and which had caused the patient intense suffering for years previously.

The patient has gained more than 30 lb. in weight and complains of no pain whatever, except occasional burning in the urethra.

The publication of the foregoing case of inflammatory stricture of the urethra seems justified because of the rarity of such cases in the literature.

Kelly, who regrets the rarity of reports on ureteral strictures, classifies them according to their location, extent, and cause. In regard to *extent*, he states that a stricture may vary from a narrowing of the ureter, limited to one particular area, not more than a few mm. in length, to 1 cm. or more in length, and cylindrical in form. He has seen but one stricture limited to a smaller area.

In regard to *cause* he divides ureteral constrictions into three classes: (1) Those due to *extrinsic factors* (tumors, pelvic inflammations, fibromata); (2) those due to *conditions within the walls*, such as *thickening* in the walls from tubercular or pyogenic infections, the secondary effects of irritation by calculi (the kinking of the ureter might be considered in this class, as well as the result of the third class); (3) those due to *something within the ureter* (such as stone and occasionally, perhaps, clotted blood). Annular stricture of the ureter is very rare, and is always secondary.

The writer would prefer to divide the ureteral strictures into (1) congenital and (2) acquired.

(1) In congenital strictures, we find anomalies of the ureters in the form of *cicatricial constrictions*, the cause of which, very probably, is to be found in sand formation during fetal life, or we find these congenital strictures in the form of *valvular formations*, which consist of duplications of the mucosa. These valvular formations are very frequent in unborn or newly born children. The congenital strictures may also appear as kinks, which play quite an important rôle in the transformation of the movable kidney into hydronephrosis or intermittent hydronephrosis. The urinary stases in these cases may lead, even during fetal life, to an immense hydronephrosis which becomes quite an obstacle for delivery. More frequently, however, the symptoms arise after the birth of the child. This explains the fact that the largest number of cases of hydronephrosis pertains to the period immediately following birth and to the age between twenty and fifty.

Concerning the *location* of these congenital strictures, we find them mostly at the upper or lower end of the ureter. According to

Nash they are usually not multiple. Tuffier states that in 29 cases of congenital hydronephrosis a stricture was found in the upper end of the ureter in 15 cases, at the lower end in 14 cases, usually caused by congenital kinking of the lower ureteral end, abnormal insertion in the bladder, etc. There are about 50 cases of cystic dilatation of the vesical end of the ureter reported in literature.

Koenig describes a very interesting case of intermittent cystic dilatation of the vesical end of the ureter, diagnosed cystoscopically from the sac-like pouting into the bladder of the vesical ureter.

Kelly, in discussing stricture of the vesical ureteral orifice and pouting ureter, states that a number of such cases has been reported, but as far as he knows no case has been diagnosed and treated *intra vitam*. He reports the case of a woman, who, six months before he saw her, had attacks of lower abdominal pain, accompanied by a temperature of 102° F., and much tenderness in the right side. Abdominal incision revealed both ovaries small and sclerotic, uterus normal. The appendix was removed and the uterus suspended, but the woman continued having pain. On vesical examination he found a stricture of the vesical orifice of the ureter affecting only its mucous surface. He took a delicate pair of vesical scissors, and when the sac was fully distended cut a slit 5 mm. in length; 15 c.cm. of urine gushed out at once, later 60 c.cm. escaped. A cure resulted.

Adrian reports a case of intermittent cystic dilatation of the vesical end of the left ureter. The condition was relieved by making a suprapubic opening of the bladder with an incision into the little mucous tumor, afterwards suturing the vesical end of the ureteral mucosa with fine catgut. He calls attention to 52 cases of dilatation reported in the literature, in 12 of which the diagnosis was made *intra vitam*.

(2) *Acquired* strictures of the ureter may be either of a *traumatic* or *infectious* nature.

Lohnstein reports 1 case of 'probably' traumatic stricture of the left ureter, which on first examination showed obstruction 5 cm. above the vesical orifice. After repeated hypodermic injections of thiosinamin, each 0.2 gm., he could pass a filiform fishbone sound and later a ureteral catheter, No. 7. Clinical cure resulted. Another case showing a stricture of the ureter 2 cm. above orifice was successfully treated by him by using gradual dilatation, first with filiform bougies, later with catheter No. 8. He also injected 1 per cent. silver nitrate into the renal pelvis in this case. A cure resulted. Etiology not quite clear. A third case in which a left pyelonephritis with ureteral stricture was diagnosed—etiology unknown—did not yield to injections with thiosinamin, nor to specific treatment, though the Wassermann reaction had proved positive. Nephrectomy had to be resorted to, to obtain a cure.

The trauma may take place from the outside and result in stricture like the one described by Pye-Smith. Male, *æt.* twenty-four,

frequently kicked in abdomen by horse. Died as a result of diarrhea. Autopsy showed right ureter dilated $1\frac{1}{2}$ in., then contracted so as not to permit the passage of the smallest probe. Injury to abdominal viscera from kick probably caused injury to ureter. During the two years following, canal was gradually contracting and forming stricture. Consequently pelvis of kidney gradually expanded. Adhesion to colon caused the diarrhea and suppuration from which the patient died.

Sollier's case was one of traumatic stricture of the ureter, in a man of forty-five years of age, who, in 1870, sustained a traumatism by a kick from a horse. Pain in left side followed, and in nine years symptoms of nephritis developed and patient died of uremia. Autopsy showed that the left kidney had been transformed into a number of cavities the size of nuts. Calyces, pelvic and upper portion of the ureter were dilated. In the middle portion of the ureter was found a cicatricial stenosis. Hypertrophy of the heart was found.

In this traumatic group belong the postoperative ureteral strictures, the strictures produced by decubitus, and those caused by a stone which had been wedged in the ureter for a long time, as in the case reported by Rydygier: Boy, *æt.* nine, suffered from paroxysms of pain in the left abdominal region, accompanied by coughing, vomiting and obstinate constipation. The urine was normal. Temperature up to 39.2° C. The case was diagnosed as intestinal obstruction. Operation revealed a ureter immensely dilated above a constricted area $1\frac{1}{2}$ to 2 cm. in length at the place of insertion of the ureter into the bladder. The lower end of the dilated portion was first implanted into the abdominal wall, the constricted lower portion resected; in a secondary operation—after the patient had sufficiently recovered from the first operation—the lower end of the ureter was implanted into the bladder. Complete recovery. Inasmuch as the patient was seized with renal colic in the right side while recovering from the first operation, with the subsequent passage of a kidney stone, the author assumes that constriction of the left ureter had been due to impaction of a ureteral stone with consecutive decubitus four years previous to operation (according to anamnestic data). These ureteral calculi have three favorite locations: The insertion of the ureter into the renal pelvis; the lower third of the ureter, where the sacrum bends forward; and the intravesical portion of the ureter.

In the group of acquired strictures belong also the strictures of the ureter caused by inflammation around the ureter and the constrictions caused by pressure on the ureter from without—pelvic tumors, displacement of the uterus, cellulitis pelvica, extreme chronic bladder retention (prostate tumor), bladder tumors obstructing the meatus of the ureter (even small papillomata near the meatus ureteris). The latter rarely lead to hydronephrosis, but cause, usually, an infectious pyelonephritis.

In contradistinction to the congenital strictures, the inflammatory strictures of the ureter are generally multiple.

Watson reports 2 cases of inflammatory strictures of the ureter:—

The first case was in a man twenty-one years of age, who had gonorrhea a year before. Coming home from a boat race he had a chill. The urine was reduced in amount and contained bladder epithelium, erythrocytes, pus, mucus, and triple phosphate crystals; also albumin. A tumor was felt in the left hypochondrium. On operation this was found to be filled with urine. It refilled within twelve hours. When Watson saw him for the first time he was uremic. Nephrectomy advised and done. Patient died. Autopsy showed both kidneys enlarged. The right ureter, 1 in. below its exit from the pelvis, showed a dense deposit of connective-tissue, originating probably from the chronic inflammatory process. The ureter was so narrowed at this point that it barely admitted a fine probe. The left kidney was the seat of an extensive hydronephrosis. The ureter was widely dilated down to within an inch and a half of the bladder. At this point was found a deposit of connective-tissue, smaller than that found in the right ureter, which had led to a narrowing of the calibre of the ureter at that point. In this case there was a doubtful history of the passage of a renal calculus about eight months previous to death.

The second was the case of a man, thirty-eight years of age, who had occasional attacks of pain in the right kidney region for eight or ten years. Six years ago he began to suffer from frequent urination and gradually lost flesh. Pus in the urine all this time. Also blood at times. Passed calculi in August, 1890. No relief. Bladder was drained to relieve the severe irritability. Entire relief of pain and irritability followed for a week. Then a mild attack of epididymitis on left side. Hiccough and vomiting the next day and death ensued March 15th, 1891, eleven days after operation. Autopsy showed: Chronic cystitis; at a point about 2 in. above the bladder the left ureter was obliterated by a dense deposit of connective-tissue which extended for about $1\frac{1}{4}$ in. in length. This mass occupied all the tissues of the ureter from the mucous membrane outward, and constituted a true inflammatory stricture. Above this point the ureter was widely dilated and chronically inflamed. The left kidney was represented by a thick-walled sac, lined with a pyogenic membrane. The right ureter was widely dilated from the bladder to within $\frac{1}{2}$ in. of the kidney. At this point it was bent upon itself, and was occupied for a distance of about $\frac{3}{4}$ in. by a mass of connective-tissue similar to that described as situated in left ureter; the calibre of ureter was narrowed so as only to admit a large steel knitting needle. Pyelonephritis of the right kidney.

Galliard mentions the case of a man, sixty years of age, who had been well until a day before admission to the hospital; continuous

pain over lumbar region with fluctuating tumor. Died from uremia four days after admission. Autopsy showed hydronephrosis of left kidney due to presence of an inflammatory stricture, $1\frac{1}{2}$ cm. long, in the course of the ureter just below its exit from the pelvis of the kidney. There was an extensive formation of connective-tissue at the seat of the stricture.

Ayroles reports a case of a man, forty-nine years of age, who had passed several renal calculi during the past two years. Suffered from a sense of oppression in abdomen ten days before admission, and from total suppression of urine for five days, which had persisted until the sixteenth day after entrance. Died at the end of the twenty-first day. Autopsy showed obliteration of both ureters by the formation of a mass of connective-tissue resulting in stricture and occlusion.

Farlow, of Boston, reports a case of a woman, aged thirty-five, who died from suppression of the urine. At autopsy both ureters near their entrance into the bladder were found to be imbedded in a dense mass of fibrous tissue which reduced their calibre so that a very fine probe partly passed. Connective-tissue extended on either side into the broad ligaments. The ureters were moderately dilated above the strictures, as were also the kidney pelves.

Tuffier cites a case of Halle in which not less than three strictures were found, the canal between the strictures being dilated.

Fenger states that from results of autopsy we know that multiple strictures can be found as a result of chronic inflammation of the canal.

In the group of acquired strictures of the ureters belong also the cases of ureteritis, caused by infection of the ureter. In every case of ascending pyelitis we always find the ureter affected either in the form of—

(a) *Ureteritis interna*, which involves principally the inner layers of the ureter and leads to constriction as well as dilatation, producing the bead-string form of the ureter without any material thickening of its wall. One encounters the constriction in these cases, especially in two places: (1) 3 cm. above the insertion into the bladder and (2) at the point of union of the ureter to the renal pelvis.

(b) *Ureteritis externa* (periureteritis) which involves principally the outer layers of the ureter (the muscular tissue and the surrounding connective and adipose tissue). This leads to marked thickening and adhesion to the surrounding tissues, and very often brings about complete occlusion of the ureter. Such a ureter, on palpation through the abdominal wall, is felt as a rigid, very sensitive cord.

Ureteritis, as well as periureteritis, may produce dilatation, constrictions or kinks of the ureter. Clinically, it is important that ureteritis, as well as periureteritis, originates only in connection with a process ascending from the bladder, or descending from the

kidney (gonorrhea, tuberculosis, colon or staphylococcus infections).

Kelly considers the most common form of ureteritis that due to the tubercle bacillus, and the rarest in his experience, in women, that due to the gonococcus.

Morris notes 5 cases of narrowing or obliteration of the ureter near its origin or termination, produced presumably by some preceding inflammation or ulceration.

Nash had his attention called to stricture of ureter, following gonorrhea, by a specimen in the museum of St. Bartholomew's Hospital, No. 2361a, which is described in Walsham and Power's "Surgical Pathology," p. 593, under the head of stricture of the ureter. Nash believes that the strictures were produced by gonorrheal inflammation. In favor of their being gonorrheal, were the presence of a stricture of the urethra and the appearance of the strictures as if due to some severe and extensive inflammation of the walls of the ureter. That gonorrheal inflammation of the ureters may occur is evident from the fact that the inflammation occasionally spreads to the pelvis of the kidneys, causing pyelitis and pyonephrosis. Against their being congenital are the facts that the dilatation of renal pelvis and calyces was not so advanced as would have been expected if the obstruction had lasted forty-four years.

Kuester is of the opinion that up to the present time there is no proof for the claim that gonococci can ascend from the urethra or bladder. He doubts the results of Bockhardt who, after artificial infection of the urethra, found gonococci as well as putrefactive bacteria in the renal abscess; and he doubts Goldenberg's claims that the gonococci found by him in the renal pelvis had entered by way of the circulation. Kuester thinks it improbable that the gonococcus can ascend through the urinary tract up to the renal pelvis, because Bumm has held that the gonococci could grow only on cylindrical epithelium. At the same time, however, Kuester mentions that Wertheim has proved conclusively that gonococci can grow also on squamous epithelium, and that they must be held responsible for the gonorrheal inflammations which are seated in the Fallopian tubes and peritoneum.

One must admit that there are actually cases of ascending pyelonephritis in which the ureter does not exhibit any anatomical change whatsoever, not even hyperemia or swelling of the mucosa, especially if pure cultures of bacterium coli are found in the renal pelvis (Rovsing). With the ascending gonorrhea, however, the mucosa of the ureter is generally hyperemic, swollen and covered with a creamy pus (Murchison).

Kuester assumes that in all cases in which a gonorrheal infection of the urethra was followed by pyelonephritis, there must have been a mixed infection which facilitated the entrance into the circulation of the gonococci from the lower urinary tract.

The writer's case, described above, speaks distinctly against such an assumption, because when purulent urine was obtained, in sterile tubes, from the bladder, and from the renal pelvis, it always showed gonococci only, and no other bacteria. The writer's case was certainly a gonococcal infection in spite of the contention of Braasch, who claims that a Neisser infection is found in comparatively few instances as a cause of cystitis.

The claim of Osler that pyelitis, secondary to cystitis, is generally bilateral, is certainly not borne out by the writer's case, which was a unilateral pyonephrosis due to ascending infection. He speaks of pyonephrosis because there was a dilatation of the renal pelvis present caused by pus accumulation.

Surgical experience has taught us that the renal pelvis, which cannot hold more than 40 c.cm. without causing colicky pain, is not dilated. In our case there was no return flow of the liquid injected into the renal pelvis before 40 c.cm. had been injected, which certainly corroborated the diagnosis of dilatation of the pelvis.

The success of our therapy proves that there must have been a gonorrheal inflammatory stricture of the ureter, because otherwise the injections of silver nitrate and protargol could not have brought about cessation of the symptoms. The possibility of the dilating effect of mere catheterization of the ureter is admitted. The renal colics could have been produced only by an inflammatory swelling of the ureter, because, had they been produced by the pus *per se* in the renal pelvis, they must necessarily have persisted even after the treatment, for the secretion of pus from the renal pelvis continued even after the treatment. There seems, therefore, no doubt that it was an inflammatory swelling of the ureteral mucosa which, by its well-known valvular formation, caused temporary occlusion of the ureter with back pressure to the renal pelvis. Under such circumstances we are not surprised that where considerable pus forms in the renal pelvis it will occasionally lead to an obstruction of the ureter with the clinical symptoms of typical renal colic. Whether such an obstruction may be due to spasmodic contracture of the ureter, or actual inflammatory changes of the ureter, can be ascertained only by the success or non-success of the treatment.

DIAGNOSIS.

The following remarks on the etiological possibilities of renal colics are appropriate to convince the reader of the correctness of the diagnosis made in the case under the writer's observation.

Any hindrance to the normal flow of the urine, from calyces down to the meatus urethræ, is liable to bring about an accumulation of urine in the renal pelvis. As long as the secretion consists of urine only, we call the condition, according to Guyon, uronephrosis; if the liquid accumulated in the renal pelvis consists of water, we call it hydronephrosis (Rayer); if there is pus only, we call it pyonephrosis (Simon). Pyonephrosis usually originates from sec-

ondary infection of a hydronephrosis by staphylococci, streptococci, bacterium coli, or gonococci. Hydronephrosis and the pyonephrosis caused by infection of hydronephrosis is usually bilateral. Pyonephrosis may also originate from the confluence of foci of a previously established pyelonephritis, and in this case is called secondary pyonephrosis.

Hydronephrosis may be congenital or acquired: In the first case it is caused as mentioned in the beginning of this paper by the formation of folds or valves of the mucosa, kinks, tortion, partial obliteration and constriction of the ureter, or abnormal insertion of the ureter into the renal pelvis or bladder (such is the case especially in kidneys with double pelvis and double ureter). Acquired hydronephrosis may be caused by prostatic hypertrophy, tumors of the bladder, uterus, ovaries or pelvis, constriction of the urethra, peri- or parametritis, retroflexed, pregnant or non-pregnant uterus, and calculi.

Floating kidneys sometimes lead to the picture of intermittent hydronephrosis. There develops a fluctuating renal tumor with the clinical picture of very severe colicky pains, nausea, vomiting and chills, with simultaneous diminution of the urinary secretion. Suddenly the tumor and the pains disappear and there develops a marked increase in the secretion of a dilute urine. After shorter or longer intervals the attack is repeated.

The pyonephrosis of our case certainly did not develop from the confluence of pyelonephritic abscesses; in other words, was not a secondary pyonephrosis; there was no sign of nephritis present. In spite of years duration, no general symptoms have developed, such as nausea, vomiting, coated tongue, sensations of pressure in region of the kidney, toxemia, cachexia. This would be possible with a pyelitis, but hardly to be expected with a pyelonephritis; further there were no casts in the urine at any time, and the percentage of albumin never rose above 0.1 per cent. Esbach. (Albarran mentions that the albumin content in cases of parasitic pyelonephritis amounts to from 50 cgrm. to 3 grm. per litre. Rosenfeld claims that the albumin per cent. found with the gravest cases of cystitis rarely exceeds 0.1 per cent. Esbach.)

The fact that the writer could inject 50 c.cm. into the renal pelvis without causing colicky pain proves beyond any doubt a dilatation of the renal pelvis. We must therefore assume in our case a cavity filled with pus, an empyema of the renal pelvis. This empyema of the renal pelvis must not be confounded with the immense dilations of the renal pelvis which we find in 'sac kidneys,' because the pus retention in our case always lasted only a short time; besides with a purulent sac kidney we always palpate a large fluctuating tumor in the region of the kidney, whereas in the pyelonephritis cases, at least in a majority of them, the diseased kidney cannot be palpated at all. In our case we certainly can exclude a purulent sac kidney, because the most important symptom of the same, the

tumor, could not be felt. The pain in the purulent sac kidney is usually constant, and only occasionally increases to severe colics, while in our case the patient felt comfortable in the intervals.

We may also exclude the intermittent, infected hydronephrosis because there was no tumor to be palpated in the region of the kidney, and because we could not demonstrate any congenital constriction of the ureter either at its junction with the renal pelvis, or at its insertion into the bladder, and because there were never intervals during which the urine was free from pus.

The most conspicuous symptom of our case—aside from the pyuria—were the renal colics. They are caused by powerful peristaltic action of the ureter, which is a reflex action for the purpose of removing a urinary obstruction. The peristaltic waves produce a painful irritation of the sensory nerves which lie in the ureteral wall and are characterized by their paroxysmal occurrence. They increase in intensity up to a certain point and then gradually diminish. If the peristalsis overcomes the obstruction, the pain ceases at once, and the patient feels relieved. For this reason it is not surprising that we, as well as the other physicians who had treated the patient before, thought of renal calculi. We expected to find a purulent stone kidney caused by the formation of calculi in an already pre-existing pyelitis or by a purulent infection of a previously aseptic renal calculus. One could also think of a calculus lying in the ureter, and if such calculus is wedged in the middle of the ureters at a point where the ureter descends into the pelvis, one finds a very pronounced local sensitiveness corresponding to McBurney's point. If there happen to be intestinal symptoms also, one can easily make the mistaken diagnosis of appendicitis, as was actually done in our case by a very capable surgeon. We are not surprised at such a mistake when we consider that even Morris opened up kidneys forty-two times in the expectation of finding calculus—only to be disappointed by not finding it. Of course, we should always bear in mind that the purulent stone kidney in contradistinction to pyelonephritis and pyonephrosis causes hematuria much more often than the latter; that purulent stone kidney causes immense increase in adipose tissue and thickening of the surrounding tissues; that it quite frequently is accompanied by purulent paranephritis.

One could think, in our case, of a ureteral calculus, which, having been shoved back into the renal pelvis by the catheterization of the ureter, ceased to produce renal colics; but this is disproved by the subsequent course of the case. During the last seven years the patient had no more colics. In the course of so many years, a stone would certainly have passed into the ureter again. Practical experience has taught us that while a urinary obstruction of this nature may be removed by catheterizing the ureter, this latter procedure only leads to temporary, not to permanent success. (The

writer is sorry to mention that there was no Roentgen apparatus at his disposal at that time.)

All these clinical deliberations were in place at the time when the case came under the writer's observation, about ten years ago, for Vølker's article on pyelography had not appeared at that time, and was unknown to the writer before 1906. (Pyelography consists of the injection of an opaque fluid substance into the ureter and renal pelvis followed by radiography.) To-day such cases will be much easier diagnosed than before 1906, for we are in position now to ascertain definitely, by pyelography, the degree and extent of a ureteral dilatation above a stricture as well as the extent of the distention of the pelvis.

Kelly introduced for the determination of pelvic dilatation the method of measuring the amount of fluid injected into the pelvis necessary to produce renal colic. If correctly employed, this method should rarely permit of error.

Kelly's technique of diagnosing a ureteral stricture is as follows: "If one is careful to note the point at which the flow of urine ceases and then to mark the point at which the stricture is cleared, and the catheter is no longer held in its bite, an approximate idea of the length of the stricture may be gained. To do this I inject the kidney and ureter through the catheter so as to have the distended upper urinary system full. I then slowly but steadily remove the catheter, watching the flow from the end all the while; the moment there is a sudden check in the flow, which is not resumed, I measure or mark the catheter at the external urethral orifice, or else measure the length of the catheter outside the urethra. By knowing this measurement it is easy to calculate the distance from the internal ureteral orifice to the upper end of the stricture, by deducting the already known and easily measured distance from the ureteral orifice to the urethral orifice. I next measure in the same way the point at which the catheter is felt to be freed from the bite of the stricture; this measurement compared with the first gives, with fair accuracy, the length of the stricture. The first measurement must be made to the eye in the catheter which controls the flow and the last to the point beyond the eye where the end begins to contract."

Clinical diagnosis of renal disease is now probably the most exact in the field of abdominal diagnosis, due to the progress in radiography and cystoscopic examination. Subjective symptoms referred to the urinary tract are often unreliable.

Kelly knows of no particular symptom diagnostic of stricture even in the advanced cases; it is, however, safe to say that in a large percentage of cases of advanced renal infection a ureteral stricture will be found.

Tenny claims that "a one-sided pain in the pelvis, abdomen, or back, with any sort of variation from the normal in the bladder action may mean ureteral obstruction." His claim is well supported

by the cases he reports: A woman noticed an intermittent tumor below her left ribs, associated with backache and nausea, operation revealed a vessel looped around the ureter at the level of the lower pole. Another one complained of urinary frequency, associated with rectal tenesmus and left-sided pain for more than thirty years; the cause was an artery which crossed the ureter a little below the hilus. Another woman suffered with pain in the right side, nausea and vomiting caused by band across the ureter, apparently not connected with the renal vessels, and a very movable kidney.

Other cases showed frequent urination, vomiting, hematuria, renal colic, pain at the end of every urination, due either to hydro-nephrosis, renal, ureteral calculus, pyelitis or tuberculosis of the kidney—always producing ureteral obstruction.

"If a patient with obstructed ureter continues to have pain after an operation which may have removed a chronic appendix or a cystic ovary or repaired some damage of childbirth, the patient has disappointment added to the pain and the operator has chagrin for his share" (Tenny). He concludes that "two symptoms appear almost in every condition which obstructs a ureter: (1) A pain between the point of obstruction and the tenth rib, on the obstructed side; (2) an alteration from the normal habits of urination (increased frequency, urgency, incontinence). The unconfirmed diagnosis of cystitis should go the way of gastritis into the museum of cloaks to hide our ignorance."

THERAPY.

Discussing the therapy of ureteral constrictions, and of the pelvic suppurations, which are very often associated with ureteral constriction, we first must admit that Osler is very right when he claims that there are practically no medical remedies which have much influence upon the pyuria. The treatment of these constrictions depends upon the site, extent, and character of the stricture, and on the state of the urinary tract above the stricture.

1. The most simple and most satisfactory method of treating stricture is dilatation by means of bougies; in tight strictures with thickened ureteral walls the effects of dilatation are often only temporary.

Kelly cites a few of the more fortunate cases selected from a large number.

One case was that of a patient who came to him with a tight tortuous stricture of the left ureter beginning at its vesical orifice and extending for about 2 cm. Examination showed diplococci which had the typical appearance of gonococci. Kelly dilated this stricture with metal dilators and washed out the urinary tract above with bichloride of mercury and nitrate of silver, until the urine became clear. Patient returned home and has been in perfect health since. Kelly reports 3 more cases treated similarly with recovery in all.

This dilatation of the stricture by flexible or metal catheters in graduated series, up to 4 or 5 mm. in diameter, is the ideal method, and may be employed also from the renal pelvis in case the stricture is located in the upper part of the ureter.

Kelly reports a case, belonging to this group, of stricture of the upper ureter treated by dilatation: A man, *æt.* forty-two, had repeated attacks of pain in the left side which interfered with his calling as an evangelist. The attacks which began in 1879, were renal, and as nothing was found on physical examination he exposed the kidney and by rotation brought into view a large hydro-nephrotic pelvis of about the same size as the kidney itself. The ureter, which began normally, suddenly contracted until it was only about 2 mm. in diameter at a point 2 cm. below the pelvis. There were no signs of any adhesions or evidence of previous inflammation. He incised the pelvis of the kidney about a centimetre above the ureter and then through this orifice introduced metal catheters, gradually dilating the stricture until a catheter about 5 mm. in diameter was passed with some apparent rupture of the inner coats of the ureter. Patient made a perfect recovery from operation and has never had any pain since.

When one considers that Kuester practised pyelotomy (incision into the renal pelvis) followed by injections of a $\frac{1}{4}$ to 2 per cent. solution of nitrate of silver into the renal pelvis and admits having cured only those cases of pelvic suppuration in which there was no ureteral constriction present, while with the latter he always produced purulent urinary fistulæ (35 per cent. of his cases), and Bureau even admits 50 per cent. of postoperative urinary fistulæ in these cases, one must, without hesitation, grant that the success in our case speaks decidedly for the therapy which we have employed.

By our therapy the inflammatory swelling of the ureter has subsided and thus the renal colics have subsided also.

The writer is sorry, however, to acknowledge that his success in the case mentioned cannot compare to the success Casper mentions in his 12 cases of pyelitis, of which 9 were of gonorrheal origin, while 3 were produced by infections with bacterium coli. All of these he has completely *cured by pelvic lavage!*

Kelly, too, claims that simple catheterization of the ureter and washing out of the kidney will sometimes give relief, and reports a case in a woman, *æt.* thirty-seven, with temporary stricture, easily overcome by passing the catheter but once.

2. Where the ureter is involved in inflammatory tissue, it may sometimes be sufficient to dissect it out of its bed of adhesions and set it free. This, however, is a procedure which only occasionally proves sufficient. It certainly proved unsatisfactory in the following case reported by Kelly: Woman, *æt.* twenty-eight, complained of sudden attacks of pain in the right side; first attack in July, 1903, followed by vomiting, which continued intermittently for three days. Child was born six weeks later. Since then she had almost

continued pain. Had repeated attacks similar to renal colic and at one time felt as if she had passed something per urethra. This was followed by freedom from pain for six months. Has had nine attacks in all, the last one in November, 1906. Cystoscopic examination showed the bladder and ureteral orifices normal. The right ureter was easily catheterized with a medium-sized wax-tipped catheter. In two minutes 12 c.cm. of normal looking urine was obtained, and in the following four minutes but 16 c.cm. Pure culture of staphylococcus aureus found. Following an attack of pain, right side was again catheterized and 60 c.cm. urine obtained, 8 c.cm. to the minute. On removal of catheter a scratch resembling that made by a rough stone was noted. Diagnosis: Stricture of ureter and possibility of stone.

Extraperitoneal exposure of right ureter: Ureter greatly enlarged above the brim of the pelvis; normal below the brim; at the brim of the pelvis a definite constricting band was found; wall of ureter markedly thickened at this point. No stone palpated. The dilated ureter was opened 3 cm. above the constricting band and a considerable amount of clear urine escaped. Wax-tipped catheters were passed in both directions; no scratch mark noted. Stricture dilated with Hegar dilator to No. 8. Constricting bands divided and ureter closed; drain.

Patient was relieved for a month and then the trouble returned. Attempt to pass catheter on right side unsuccessful; catheter was stopped after passing up 6 cm.

Second operation: The adhesions, which involved the ureter through its entire length, showed that the selection of the abdominal route was fortunate, even if it was found necessary to remove the kidney. A mass the size of a lima bean was exposed through an incision in the pelvic peritoneum. The exposed mass felt like a stone, and there was such a small amount of normal ureter between it and the bladder that it was decided to remove the kidney and ureter. Recovery.

3. This procedure, the extirpation of the entire supravescical urinary tract of the affected side (nephroureterectomy), is the only method in cases of strictures due to tuberculosis.

4. If the stricture of the ureter is not too extensive, it may be resected and the remaining part implanted into the bladder (as Rydygier's case above mentioned), or, as Kuester did in an upper stricture, split and implanted the unfolded end of the ureter into the opened pelvis.

5. Fenger advocated, in similar cases, his plastic operation without resection, on the plan of the Heinecke-Mickulicz operation for stenosis of the pylorus—namely, longitudinal division of the stricture and transverse union of the longitudinal wound.

According to Kelly, however, the only cases that can be treated conservatively are those which arise from injuries at operation.

RELATION OF GENERAL ARTERIOSCLEROSIS TO CERTAIN
OCULAR CONDITIONS.*

By ELSWORTH SMITH, M. D., of St. Louis,Clinical Professor of Medicine, Washington University Medical School.

Cases referred to me by ophthalmologists because of some possible general underlying lesions have excited my interest in the above subject; and it appears timely to call attention to this interdependence of ophthalmology and internal medicine in this class of cases, not only on account of the importance of the subject but on account of the feeling that through free discussion, thus provoked, both the internist and the ophthalmic surgeon might profit thereby. But I beg to ask at the outset the indulgence of the ophthalmologist for the many shortcomings that may become apparent in the handling of the ophthalmic phase of the subject by an internist.

We are forcibly reminded of the importance of the theme of general arteriosclerosis from the standpoint of life-expectancy by the words of Osler: "Longevity is a vascular question which has well been expressed by the maxim, 'a man is as old as his arteries.' To a majority of men death comes primarily or secondarily through these portals." And I am certain that the ophthalmologists will bear testimony to the profound seriousness of such ocular affections as albuminuric retinitis, choroiditis, glaucoma, etc.

Doubtless the internists will bear with me, should a few moments be devoted in recalling some of the fundamental ideas concerning the etiology and pathology of general arteriosclerosis, which may not appear trite to those limiting their studies to the subject of the eye, and which may serve somewhat as a guide in the discussion.

And before proceeding further, general arteriosclerosis is defined by Osler as "a condition of thickening, diffuse or circumscribed, beginning in the intima, consequent on primary changes in the media and adventitia, but later involving the latter two coats. The process leads in the larger arteries to what is known as atheroma and endarteritis obliterans, and seriously interferes with the normal functions of the several organs."

The etiological factors in the disease are divided into four great classes:—

(1) *Wear and tear of life*, and this might further be modified to read, *American life*. The competition in every avenue of endeavor in our country is so sharp that the American from maturity to the

*Read before the St. Louis Society of Internal Medicine.

grave is ever keyed up to the highest tension, throwing thus a constant strain on his vascular circuit, leading to early degeneration and fibrosis of the blood-vessels, even should he be temperate in all else. Under this head may also be included heredity, as everything naturally depends on the quality of the elastic tubing used in the construction of each human machine; whereby is explained a man of forty at times presenting the blood-vessels of a man of sixty.

When Oliver Wendell Holmes was asked how to live to the age of seventy, he replied that a man should begin to pick out his ancestors one hundred years before he was born.

(2) *Acute infections*, and in this group we have the explanation of the cases of vascular disease occurring before the fourth decade.



Fig. 1.—Cross section of normal eye showing relations in filtration angle over spaces of Fontana, canal of Schlemm and anterior ciliary veins. (Kindness of Dr. A. Alt.)

And first among this group must rank syphilis, then the eruptive fevers, also diphtheria and influenza. And Thayer has recently called attention to the vascular lesions consequent on typhoid fever. Tuberculosis and all the chronic infections must also be included in this class.

(3) *The intoxications*. First the exogenous as alcohol, nicotine, lead. Cabot claims that alcohol does not cause vascular disease, but his position has not been conceded by most of the best authorities. Secondly, endogenous toxins may be mentioned, the poisons probably resulting from faulty metabolism in gout, diabetes, chronic Bright's disease and obesity, and also the auto-intoxications and auto-infections from the gastro-enteric tract.

(4) *Conditions that keep up high blood tension*, and said condi-

tions are to be mainly found in overeating which acts in two ways, first by keeping the blood-vessels constantly overdistended, and secondly, in the process of primary and secondary metabolism substances may be formed in the digestive tracts which are directly toxic.

Allbutt says, "one main cause of rising arterial pressure in middle life is excess of feeding, that is of food in excess of work and excretion," and Osler adds, "damage is certain to follow from accumulation of waste and the disproportion between intake, work and output." Those who live mainly on a vegetable diet, as the Indians and the Japanese, are said to be far less affected than meat eaters, such as the Europeans and Americans, for instance.

The question as to which is primary, the sclerosis of the vessels



Fig. 2.—Section through glaucomatous eye, showing iris carried forward and in apposition to posterior surface of cornea with consequent blocking of filtration angle. (Kindness of Dr. A. Alt.)

or the hypertension, is still in a way *sub judice*, and we must probably as yet recognize two classes of cases: one in which the hypertension produces a chronic interstitial nephritis, which is secondary to an acute nephritis, and the other a class, by far the least common, where the hypertension is secondary to the rigidity and narrowed lumen of the arterial tree and resulting directly from sclerosis.

As to the pathology of the disease, it is generally, I believe, considered to be primarily a degeneration and weakening of the media, favoring aneurysmal bulging at said points, a weakening with a secondary proliferation and thickening of the intima, which latter process is, according to Thoma, compensatory to the lesion in the media.

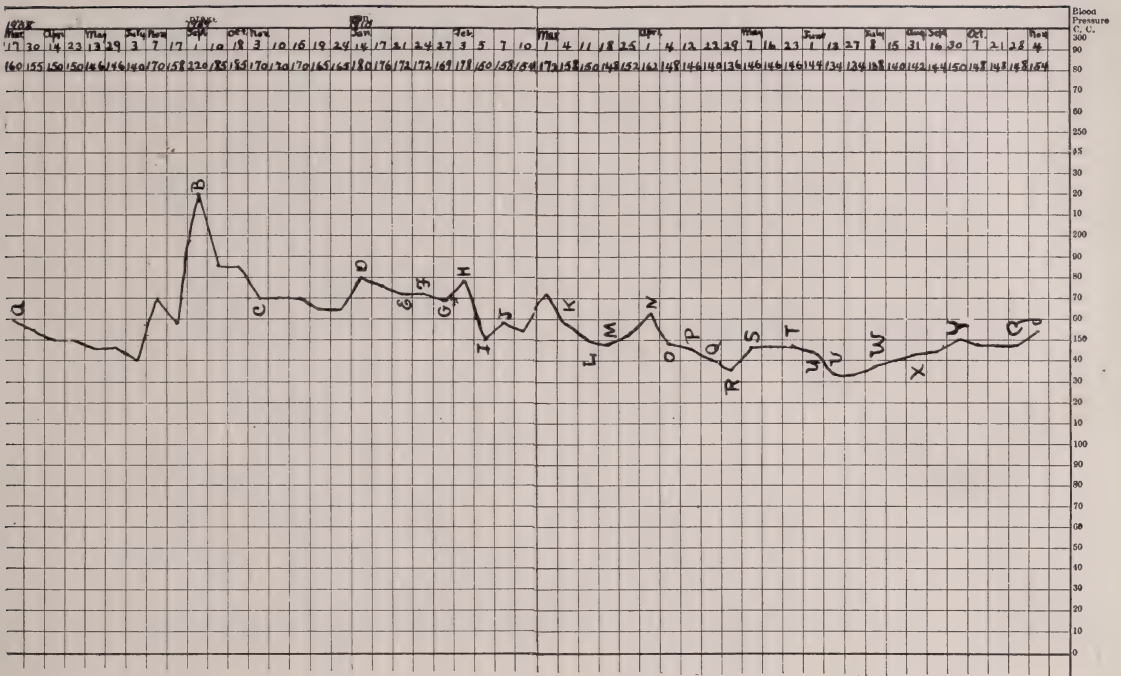


Fig. 3.—Case III. Hyalitis of right eye. Recovery. Later edema of optic nerve and capillary hemorrhage in retina of left eye. Vision increased from 4/240 to 19/240. Great rise of blood-pressure on September 1st, 1909, patient having been without treatment since November 17th, 1908.

- A. Bichloride of Hg, 1/12 gr. Diet and general regime.
- B. No treatment for ten and a half months. NaNO_2 1gr. before breakfast.
- C. NaNO_2 1 gr. three times daily, increased to $2\frac{1}{2}$ gr. three times daily on November 24th, 1909.
- D. No treatment for sixty days. Left retinal edema and hemorrhage. 1/100 gr. nitroglycerine three and four times daily.
- E. Eye much improved.
- F. $1\frac{1}{2}$ gr. NaNO_2 three times daily, increased to 3 gr. three times daily.
- G. Hemorrhage being absorbed.
- H. Eye worse. $2\frac{1}{4}$ gr. NaNO_2 three times daily.
- I. Eye better. $1\frac{1}{2}$ gr. NaNO_2 noon; $2\frac{1}{2}$ gr. morning and evening.
- J. Still bleeding in left eye. $2\frac{1}{4}$ gr. NaNO_2 three times daily.
- K. Hemorrhage being absorbed.
- L. Eye doing well. $1\frac{1}{2}$ gr. NaNO_2 at noon; $2\frac{1}{4}$ gr. morning and evening.
- M. Vision a little better.
- N. Has used eyes more. 3 gr. NaNO_2 in morning.
- O. Fresh hemorrhage in left vitreous; right eye well.
- P. 3 gr. NaNO_2 in morning; $2\frac{1}{2}$ gr. noon and p. m.
- Q. $2\frac{1}{2}$ gr. NaNO_2 three times daily.
- R. Absorption of hemorrhage marked. $2\frac{1}{4}$ gr. NaNO_2 a. m. and p. m.
- S. $1\frac{1}{2}$ gr. NaNO_2 at noon; $2\frac{1}{4}$ gr. a. m. and p. m.
- T. Erythrol tetranitrate, 1/6 gr. a. m. and p. m.
- U. Can see at eleven instead of ten feet.
- V. 1/12 gr. erythrol tetranitrate p. m.; 1/6 gr. a. m.
- W. 1/6 gr. again p. m.
- X. $1\frac{1}{2}$ gr. NaNO_2 three times daily.
- Y. Vision better; 1/6 erythrol tetranitrate three times daily.
- Z. Has played a little golf. Erythrol tetranitrate stopped.

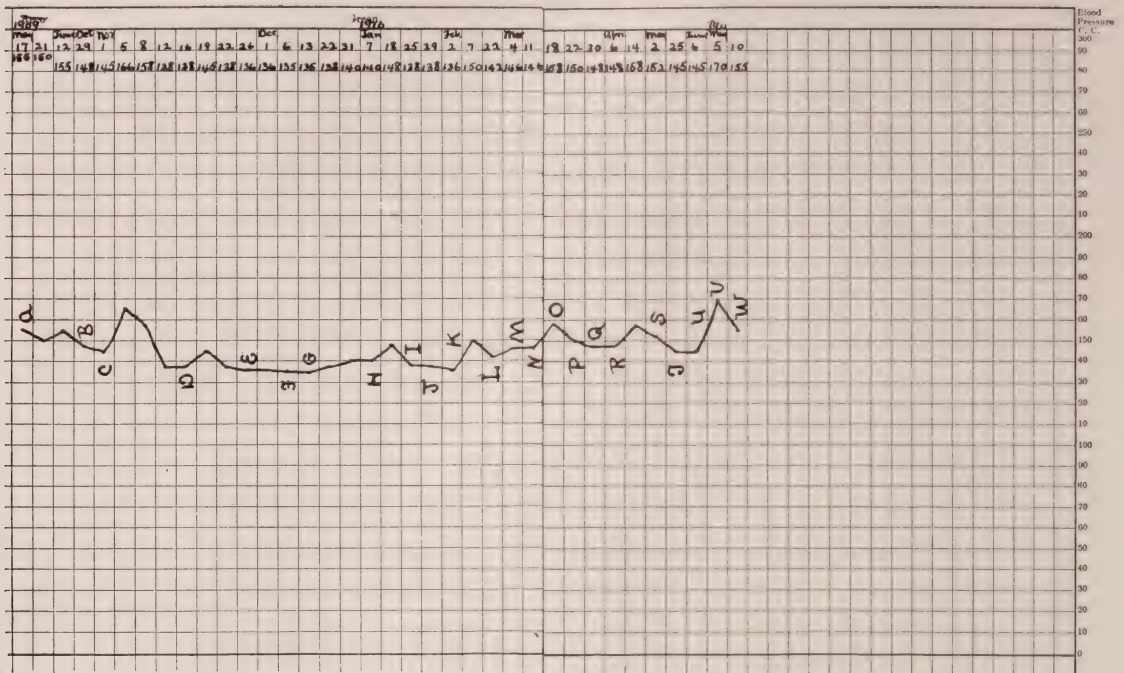


Fig. 4.—Case IV. Hemorrhagic glaucoma. Control of blood-pressure, and consequent (or resulting) lessening of edema of ciliary process and retina so lessened pain as to permit of the use of eserine and pilocarpine. November 24th, 1913, glaucomatous eye quiescent and comfortable. Enucleation prevented, other eye normal.

- A. Bichloride of Hg, iodide of potassium gr. 5. General regime.
- B. NaNO_2 $\frac{1}{2}$ gr. begun on October 26th, 1909.
- C. NaNO_2 1 gr.
- D. Eye much better.
- E. Pilocarpine not painful. Standing local treatment well. 1 gr. NaNO_2 three times daily.
- F. Pupil responds to pilocarpine.
- G. NaNO_2 stopped.
- H. Control of pressure seems to lessen edema of retina and ciliary processes which is cause of pain in use of eserine and pilocarpine. NaNO_2 1 gr. daily.
- I. Eye much more comfortable. Taking 2 gr. NaNO_2 since January 20th, 1910.
- J. Eye doing well. 1 gr. NaNO_2 three times daily.
- K. Eye comfortable.
- L. No NaNO_2 since February 7th, 1910. Take again 1 gr. three times daily.
- M. Eye much better. Taking 2 gr. NaNO_2 three times daily.
- N. Doing well.
- O. Under a great strain.
- P. Eye doing fairly well.
- Q. Eye better.
- R. Some keratitis again due to excitement.
- S. 2 gr. NaNO_2 twice daily since last note.
- T. 2 gr. NaNO_2 a. m. and 1 gr. p. m.
- U. No pain in eye now.
- V. Recovery from a series of epistaxis. Saturated solution of potassium iodide, 5 gts, three times daily.
- W. No more epistaxis. Reduced iodide to twice daily.

This process in the coats of the vessel-wall may also result in calcareous deposits giving the brittle pipe-stem arteries, and the proliferating process in the intima may extend into the lumen of the vessel, resulting in endarteritis obliterans with the consequent disturbances of nutrition in the area supplied by the vessels.

Though arteriosclerosis is a general disease, the arterial circuit is not always uniformly involved. In some cases the brunt of the disease is spent on the heart, in others on the kidneys, the brain, digestive tract, etc., and, according to the distribution of its ravages, arise the various symptoms, making up the complex picture of the disease, the end coming to its victims at times suddenly through an acute cardiac dilatation or an apoplexy, or more gradually with all

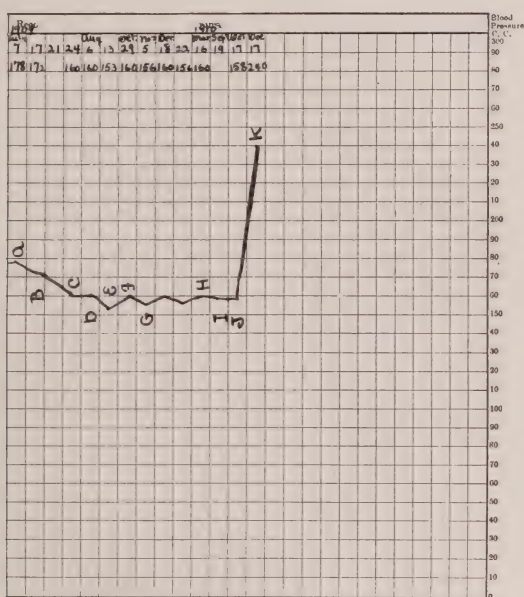


Fig. 5.—Case V. Albuminuric retinitis and retinal hemorrhages showing control of blood-pressure and symptoms for a period of one and one-half years, until onset of uremia about December 17th, 1910, followed shortly by death of patient.

- A. Corrosive sublimate 1/24 gr. three times daily. General regime.
- B. No fresh hemorrhages, old ones being absorbed.
- C. Two small retinal hemorrhages have disappeared but large temporal one is unchanged.
- D. Absorption of hemorrhages continues, can now read another line of test letters.
- E. Vision has all cleared up, can play a little golf.
- F. No fresh hemorrhages. NaNO_2 $\frac{1}{2}$ gr. twice daily.
- G. Little detached blood pigment in vitreous.
- H. Exudation in eye being absorbed.
- I. Played golf for two months, slight edema in ankle.
- J. Nausea for a week. Uremic.
- K. Marked nausea, fresh hemorrhage into left eye, impaired vision. NaNO_2 , $1\frac{1}{2}$ gr. a. m. and p. m.

the long drawn-out symptoms of an uncompensated chronic heart lesion or chronic uremia.

As to the progress of this malady, we, of course, must realize that the organic changes in the vessel-wall cannot be undone any more than a damaged valve in the heart can be replaced by a normal one; but much can be done towards arresting and limiting the process by removal of the causative factors. And the earlier, of course, the conditions can be detected, the better the outlook, other things being equal, for a comfortable and useful life during a number of years. The point I wish especially to emphasize is that the condition must be recognized early.

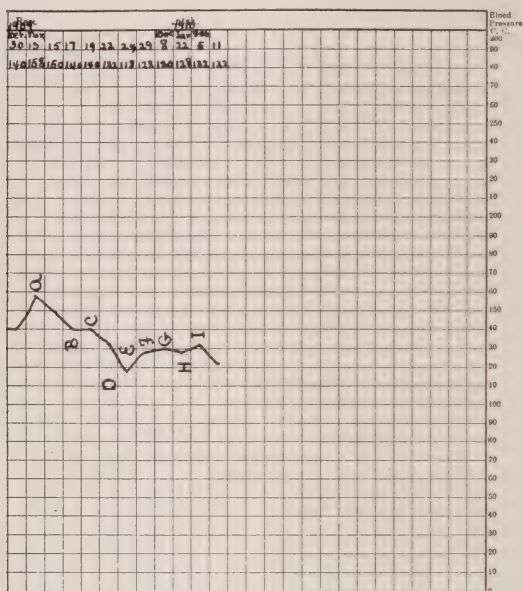


Fig. 6.—Case VI. Retinal hemorrhages. Continued and marked improvement under lowering of blood-pressure.

- A. 1 gr. NaNO_2 two times daily. General regime.
- B. Vision better.
- C. Vision improving.
- D. Test of vision shows improvement.
- E. Eye better. 1 gr. NaNO_2 in a. m.; $\frac{1}{2}$ gr. p. m.
- F. Vision better. 1 gr. NaNO_2 a. m.; $\frac{1}{2}$ gr. p. m.
- G. Continued improvement of vision. No NaNO_2 since December 4th.
- H. 1 gr. NaNO_2 each morning.
- I. Eyes doing well. 1 gr. NaNO_2 in morning stopped at this date.

This brings us to the subject proper—namely, that the eye is the organ where arteriosclerosis is often earliest manifested and where it can be most accurately appreciated through study of its background. So impressed are the internists and surgeons with the great value of the ophthalmoscope as a diagnostic aid in the affection under consideration, and in many other maladies, that oph-

thalmoscopic examinations are now practised as a routine procedure.

Foremost, of course, among the ocular lesions of general arteriosclerosis, ranks retinitis or the so-called albuminuric retinitis.

And it is especially in the degenerative form of the so-called albuminuric retinitis, rather than in the inflammatory variety, that arteriosclerosis is most typically manifested, presenting in the ophthalmoscopic picture the thickened tortuous arteries, and at times strapping of the veins, hemorrhages, exudations, degeneration, etc., all of which signs point to a degeneration of the retinal vessels with increased arterial tension, direct results of the disease—arteriosclerosis.

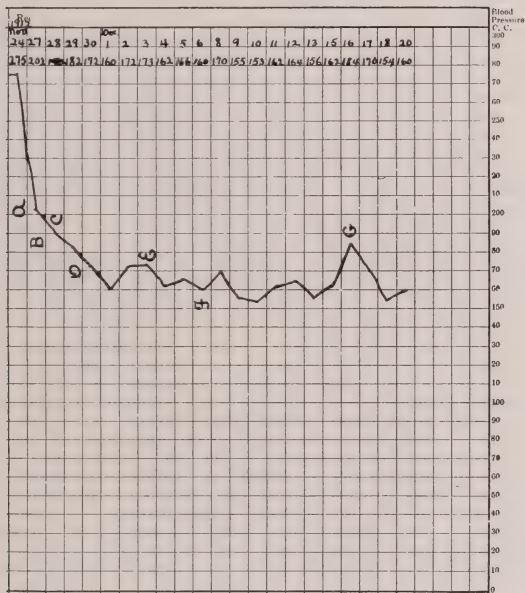


Fig. 7.—Case XII. Retinal hemorrhage (right). Threatened apoplexy averted and retinal hemorrhage controlled by prompt and complete rest in bed and free purgation without use of any of the remedies of the vasodilator group.

- A. Severe headache. Absolute rest in bed. Capsule of podophyllin, aloes and colocynth. Salts in morning. General regime.
- B. Acetanilid, sodii bromide and caffeine.
- C. No headache during day.
- D. Patient up in chair for a short while.
- E. Patient out for a walk.
- F. 5 gtts. potassium iodide three times daily.

Cushing, however, in a paper, entitled "Observations on Choked Disc with Especial Reference to the Decompression Cranial Operation," and read before the Ophthalmic Section of the American Medical Association, June, 1908, takes the position that choked disc and so-called albuminuric retinitis are practically the same pathological process, and are both produced in the same way—namely,

TWELVE CASES STUDIED, IN TABULATED FORM.

Case Name Date	Sex Occupation Age	Earliest Symptoms	Blood-pressure	Diagnosis	Treatment	Result
No. I E. B. A. March 16, 1907.	Male, Lawyer, 64	Flashes of light before eyes, followed by flakes of soot.	Sys. Pres., March 3, 07, 140 mm. Sys. Pres. to-day 200 mm.	Arteriosclerosis. Hemorrhages into vitreous.	General plan in all cases included hygienic treatment; prevention as far as possible from all strain, mental and physical; removal from the strenuous life; forbiddance or limitation of alcohol, nicotine and overeating, especially of the proteid articles	No definite increase in eye lesion. In June, 1912, cerebral thrombosis with hemiparesis; now slowly convalescing.
No. II G. P. W. Nov. 29, 1907.	Male, Retired, 77	August, 1905. Slight evanescent hemiparesis followed in twenty days by hemorrhagic glaucoma.	Nov. 29, 07, Sys. Pres. 160 mm.; going to 240 mm. Dec. 12; now about 180 mm.	Retinal hemorrhages, hemorrhagic glaucoma, arteriosclerosis with cardiac compensation failure.		Loss of right eye. Renal hemorrhages now in last stages of myocardial degeneration.
No. III A. E. July 3, 1908.	Male, Bus. Man, 65	Dimness of vision. Floating bodies before eyes. Threatened apoplexy.	Sys. Pres. 200 mm.	Opacities in vitreous (right). Hemorrhages into and degeneration of retina (left). Arteriosclerosis.		Saving of right eye, loss of left through retinal degeneration. Prevention of apoplexy.
No. IV M. H. S. May 17, 1909.	Female, Nihil, 66	Film over right eye.	Sys. Pres. 155 mm.	Retinal hemorrhage. Hemorrhagic glaucoma. Arteriosclerosis.		Hemorrhagic glaucoma developed in July, 1909, with loss of vision in right eye; other eye remains in fairly good condition.
No. V A. C. F. July 7, 1909.	Male, Lawyer, 52	Dimness of vision.	Sys. Pres. 178 mm. Dias. Pres. 148 mm.	Hemorrhages surrounding right disc and several small vessels kinky in outline. Arteriosclerosis.	Death from uremia. Many of the blood splashes in retinae were absorbed in the autumn of 1909.	Death from uremia. Many of the blood splashes in retinae were absorbed in the autumn of 1909.
No. VI D. P. D. Oct. 30, 1909.	Female, Nihil, 70	Disturbance in vision.	Sys. Pres. 140 mm.	Retinal hemorrhage in right eye. Arteriosclerosis.		Improvement in eyes.

No. VII A. M. L. Dec. 16, 1909.	Female, Nihil, 63	Specks and sparks before eyes, espe- cially left.	Sys. Pres. 160 mm.	Hazy vitreous. Slight strapping of retinal veins. Arteriosclerosis.	Result unknown.
No. VIII D. L. Nov. 19, 1909.	Female, Nihil, 70	Disturbance of vis- ion.	Sys. Pres. 138 mm.	Choroiditis and incip- ient cataract. Arteriosclerosis. Incipient cataract.	No improvement ex- pected.
No. IX L. L. S. Sept. 19, 1910.	Male, Retired, 54	Disturbance of vis- ion. Nerves are atrophic and very dark.	Sys. Pres. 180 mm.	Retinitis pigmentosa of fifteen years' duration. Arteriosclerosis.	Slight increase of trouble, May 26, 1911.
No. X L. J. J. June 19, 1911.	Male, Retired, 73	Sudden loss of vision in right eye; ten days later in left eye.	Sys. Pres. 168 mm.	Hemorrhage into sheath of optic nerve (right), and later into left. Vasodilators, Venous stasis and edema of both retinae. Anterior uveitis in both eyes. Arteriosclerosis.	Blindness from atrophy in both retinae.
No. XI W. K. Oct. 1, 1912.	Male, Clerk, 55	Failing vision in right eye.	Sys. Pres. 175 mm.	Absolute rest in bed for a more or less pro- longed period in serious urgent cases.	Some improvement.
No. XII C. R. J. Nov. 24, 1912.	Male, Druggist, 53	Glasses he was using became ineffective. Severe headache. Threatened apoplexy	Sys. Pres. 215 mm. Dias. Pres. 170 mm.	Retinal hemorrhages. Arteriosclerosis. Swelling of nerve-head.	Retinal hemorrhage ab- sorbed. Subsidence of swelling in nerve-head. Sight much better.

Summary.—Sex: Males 8, females 4. Age: Youngest 53; eldest 77. Occupation: Business men 6, lawyers 2, nihil 4. Earliest symptoms: All ocular; blood-pressure high except in Case VIII, which was in early stage. Diagnosis: Hemorrhage into retina 7, hemorrhagic glaucoma 2, hemorrhage into vitreous 1, retinitis pigmentosa 1, choroiditis and incipient cataract 1, hemorrhage into sheath of optic nerve of both eyes 1. Results: Improved 4 cases or 50 per cent.; markedly improved 2 or nearly 25 per cent.; prevention of enucleation 1; incipient cataract 1; result unknown 1; some increase of trouble 1; loss of vision in one eye 3 (2 of glaucoma and 1 of retinal degeneration); loss of vision in both eyes 1; death from uremia 1.

through increased intracranial pressure transmitted along the sheath of the optic nerves. He defends his position as follows:—

First, histological studies of neuroretinal lesions in nephritis show that it is merely a modified form of choked disc.

Second, that a retinal picture typical of so-called albuminuric retinitis may occur in association with brain tumors; and in his series of 200 cases of brain tumor, 18 showed the typical stellate figures of albuminuric retinitis. In 12 of them there was no clinical suspicion of nephritis, and, furthermore, relief of the intracranial pressure through decompression in a number of the remaining cases led to a disappearance of the suggestive renal elements from the urine.

Third, in a number of cases in the medical wards, showing typical choked disc with none of the signs supposed to characterize albuminuric retinitis, autopsy disclosed in the brain no lesion other than edema together with the evidences of advanced renal disease.

Fourth, in a number of patients with nephritis, lumbar puncture, when pressure symptoms have been present, has invariably disclosed a cerebrospinal fluid under increased pressure, and its withdrawal led to an improved appearance in the fundi, only to grow worse again with the inevitable reaccumulation of the fluid.

Fifth, experimentally the ligation of the nerve sheath distal to the chiasm, with sufficient pressure to obstruct venous return but not arterial flow, did not produce choked disc, though the veins did become tortuous and engorged. On the other hand, at removal of the ligature and exertion of sufficient pressure on a portion of the dura through a trephine hole over the hemisphere, the ampullated distention of the subvaginal space would quickly occur and the disc promptly become edematous.

Though this position of Cushing is an ingenious one, I should like to ask why, at least in the case of the degenerative form of retinitis, we should go beyond the diseased condition of the retinal arteries for an explanation of the retinal lesion.

Among the etiological factors of choroiditis, arteriosclerosis does not appear to be mentioned, and yet if, as we have seen, general vascular sclerosis can be responsible for retinitis, it would certainly appear reasonable to assume that it might also be responsible for an inflammatory process in the vascular coat of the eye. In one case under observation such a cause appeared to be the only tangible one.

In the subjects of general arteriosclerosis, hemorrhages into the vitreous follow rupture of vessels of the retina and choroid. As a rule, they are not entirely absorbed but leave fixed or floating opacities.

And now as to the possible rôle of arteriosclerosis in the pathogenesis of glaucoma. There are certain considerations which speak rather strongly for such a relation.

(1) According to Priestley Smith, in a careful analysis of 1,000

cases, the chance for development of glaucoma is one hundred times greater at the age of sixty-five than at fifteen, and almost twice as great at forty-five; this might equally well be applied to the development of arteriosclerosis; hence the diseases are more or less contemporary as to the age for development.

(2) We know that glaucoma is directly due to a disturbance between the secretion and outflow of the fluids of the eye and mainly of the aqueous humor, that the aqueous humor is a secretion from the ciliary body, especially from its processes, and that the higher the blood-pressure in the ciliary processes, the greater will probably be the secretion of aqueous. We know also that the principal outlet for the ocular fluids is at the filtration angle through the spaces of Fontana, canal of Schlemm and thence into the anterior ciliary veins. A blocking of this main outlet of the fluids of the eye is a frequent cause of glaucoma, and this outlet in the filtration angle is often blocked in the following way—namely, through hypertension of the blood-vessels, the ciliary body and processes being pressed against the root of the iris and thereby carrying the iris forward in apposition or adhesion against the periphery of the cornea, thus blocking the filtration angle.

Having thus reviewed the part probably played by general arteriosclerosis in the aforementioned diseases of the eye, the next question which naturally arises is what bearing should such a relation of cause and effect have on the treatment of these conditions?

Aside from the various operative measures in the eye affections alluded to, the main stay in the treatment appears to be bichloride of mercury and iodide of potassium, not only in cases with a luetic element but also in the non-luetic. While these are most valuable drugs and doubtless do a great deal of good, yet I desire now to emphasize a second point, which is that all ocular conditions which can reasonably be assumed to be dependent upon general arteriosclerosis should be given the benefit of a general therapeutic regime along the following lines:—

1. When the conditions in the eye are so grave as to threaten the integrity of the organ, the patient should immediately be placed at complete rest in bed with the hope of thereby assisting in the reduction of the arterial tension, and thus averting a calamity in the eye as well as in the heart, brain, etc.

2. That if the condition in the eye or general condition be not urgent enough to require complete rest in bed, then the patient should be urged to pursue the even tenor of his life, free as possible from all sources of worry and strain. The strenuous life must be dropped, though it is not well to rob an active man of all occupation, but he must be taught moderation in work.

At the proper time exercise must also be insisted on of a moderate graduated kind, as walking, golf, etc., and what is most important, a careful diet. Alcohol and nicotine and meat must at first be denied, and later greatly limited for such patients. Milk, and es-

pecially buttermilk, must be taken freely, bringing to mind Metchnikoff's theory of the control of intestinal fermentation in the large intestine by lactic acid products. As to medicinal remedies, iodide of potassium has a double value, because, experimentally, it has been stated that arteriosclerosis may be prevented if iodide of potassium is given coincidentally with adrenalin. It is thought by some to have an influence in the lessening of arterial tension.

Of drugs having a more direct effect on the lessening of blood tension we have the nitrate group. Nitroglycerine 1 to 5 mm. of 1 per cent. solution may be given three or four times daily, but though given in large doses its effect is quite transient. Nitrate of sodium in 1 to 4 gr. and erythol tetranitrate, $\frac{1}{2}$ gr., every four to six hours have a more permanent action. All these remedies of the group of vasodilators are, of course, mainly indicated to meet certain emergencies where disaster is threatened by excessive hypertension. In the main, we must depend on diet, rest, regulated exercise and careful and thorough elimination in the management of this class of cases.

The allotted time has only permitted the presentation in tabulated form of the observations and results obtained in the 12 cases studied, together with the blood-pressure charts of such cases of this group as elucidated especially some of the results obtained.

NOTES ON EUGENICS.

By B. S. TALMEY, M. D., of New York.

"The science of eugenics has its birthplace in the highest emotions and kindest feelings. It is the highest developed altruism of mankind." Just as the egotism of early childhood, centred in the preservation of the individual, at puberty, gives way to a kind of altruism in the interest of the species, so the egotism, centred in one's family, clan, tribe and nation, gives way to the higher altruism of the improvement of the unborn generations, when humanity reaches a higher stage of culture.

There comes a time in the life of every individual when the extreme egotism of the instinct of the preservation of the individual gives way to a kind of altruism rooted in the instinct of the preservation of the kind. In the first period in the life of every animal the individual's sole solicitation is its own sustenance. In the second period the individual's greatest effort is to carry into effect the supreme law of organic nature, the preservation of the kind. For the ultimate end of propagation the animal will jeopardize its own happiness and even its life.

Through the whole range of animal life, where the period of infancy is comparatively short (*e. g.*, the horse, dog, cat, etc.), the male part is ended with impregnation or copulation. The nursing of the young is left to the female, and she will sacrifice her own life in the protection of her breed. In animals whose young are not easily provided for (*e. g.*, the fox, wild cat, eagle, sparrow, pigeon, stork, etc.), not only the mother will sacrifice her own existence in the protection of her offspring, but also the father will do his utmost in the interest of his young ones. In these animals the males remain attached to the females they have secured at the first period of estrum even after the time of propagation has passed, provide mutually for their offspring until the latter can provide for themselves, and at each succeeding period of rut, yield again to love and never seek a new mate until the old one dies. Ernest Thompson Seton found that hawks practise monogamy and that wolves consort for life, and in case of death the survivor remains alone. The Canadian wild goose, when it has lost its mate, will never seek another. Thus the instinct of permanent mating, or of monogamic marriage, is a phenomenon already found among many animals.

Among all animals, the prenatal period is almost the longest in man. The period of the maternal feeding is also the longest in man. The helplessness of the human infant is unique among the

creatures of the animal kingdom. The newborn baby is devoid of nearly all instinctive capacities. It is unable to stand or wander in search of food. It is nearly blind and deaf. It is perfectly naked, without fur or feathers, and hence is in need of a certain amount of warmth, being injured by draughts. It is in need of the utmost cleanliness, still it is unable to keep itself clean. It is unable to fast longer than a few hours. In short, the human infant is the most complete picture of helpless dependence. Hence, without the help and strength of fatherhood afforded to motherhood, the human race could not have survived. The length and feebleness of human infancy require a union of male and female of considerable duration. Permanent mating among men even in the prehuman stage was a condition *sine qua non*, all the preachings of the free-lovers to the contrary notwithstanding. For by the time the last child was able to emancipate itself from the parental protection, the period of sexual activity had been passed.

But permanent mating was a necessity only as long as the couples lived separated. When, already before the dawn of civilization, mutual aid was added to self aid, when for the sake of protection men began to live in herds, and the males had the responsibility to procure food for the entire herd, the individual father was released of such responsibility, and there was no necessity any longer for permanent mating. The result was promiscuity, as found by Cæsar (bel. gal. V. 14) among the Britons: "uxores habent deni duodenique inter se communes et maxime fratres cum fratribus, parentesque cum liberis," and by Strabo among the Celts of Ireland: "καὶ φανεῶς μέγεδ' ἔσθαι ταῖς τε ἄλλαις γυναιτὶ καὶ μητρὰν καὶ ἀδελφαῖς." From promiscuity the sexual relations run through a certain cycle of consanguineous marriage, punaluan family, pairing family, polygamy back again to monogamy, as now practised in most of the civilized countries. All these changes were made in the interest of the progeny, although often unconsciously, just as the growing affection of two lovers is, in reality, already the will for life of the new individual which they could and might beget.

Thus from the time of the caveman, men have been instinctively endeavoring to effect an improvement of the race. But there was no concerted conscious action among the leaders of men, in this respect. The thinkers of all times, especially since the introduction of Christianity, attributed the causes of all good and evil to environic forces. Until the present day, euthenics or the science of being well-bred, respectively the lack of euthenics, has been made responsible for the evils humanity is heir to.

In modern times a certain class of sociologists promulgated the doctrine that the ideal of human perfection can only be reached through inheritance. Sir Francis Galton and Karl Pearson are the main exponents of this movement. It was called by Galton eugenics or the science of being well born.

The principles of eugenics have been practised by men as far

back as history is recorded. When the different castes made intermarriage a criminal offence, or when the nobles made it the rule of their class never to dilute their superior blue blood with the red blood of the plebeian, they unconsciously worked for the eugenic ideal. The Talmud has positive eugenic rules for the guidance of marriage candidates. It is urged not to marry into a family tainted by epilepsy or leprosy (Yebamoth 64b).

The first step in the groundwork of eugenics, which in recent years has developed into a vast science, was made by Lamarck with his doctrine of the transmission of acquired characteristics to the offspring. The next step was taken by Darwin's discovery of natural selection, or, as Spencer calls it, the survival of the fittest. In theory the law of human selection has been enunciated by Kant (*Der Charakter des Geschlechts*, Vol. VII): "The woman has an exquisite feeling for the beautiful, as far as she herself is concerned, but for the noble so far as it is found in the man; the man, on the contrary, has a decided feeling for the noble, which belongs to his own qualities, but for the beautiful so far as it is met with in the woman. Hence it follows that the aims of nature are directed, through love, upon making men still nobler and women more beautiful."

This philosophical idea was proclaimed at a period when the doctrine of organic evolution was taught by a very few select, such as Goethe, and accepted by almost none. Nowadays the fact of evolution is accepted almost by all thinkers and scientists. What is still doubtful is the method of evolution. Here we have two main theories:—

1. The mechanistic
 - (a), Neo-Lamarckians
 - (b) Neo-Darwinians
2. The vitalistic
 - (a) Teleology
 - (b) Creative evolution.

According to the mechanistic theory all life can be accounted for through the application of the laws of physics and chemistry, while the claim of the vitalistic theory is that physics and chemistry do not explain all. Teleology holds that life is carrying out a pre-arranged plan; creative evolution postulates a blind primordial energy, a psychic force, a life impetus, without any prearranged plans. The Neo-Lamarckians hold that acquired characteristics during the lifetime of the individual are transmitted to its offspring. This transmission is the method of evolution. The Neo-Darwinians deny the transmission of acquired characteristics and claim that evolution has been and is effected by natural selection. The animal's germ-cells are a product of its own soma-cells and the parents' germ-cells, and as the soma-cells are being continually changed, the germ-cells must also change continually. Those beneficial to the organism are selected by nature for preservation. Ac-

cording to the Neo-Lamarckian, environment gives rise to variation, while according to the Neo-Darwinian, a given variation is selected by environment for survival.

All four theories assume evolution as a fact. That the long neck of the giraffe, for example, has been evolved to reach the leaves of high trees is admitted by all of them; they only differ in the principle underlying this evolution. According to teleology, the faculty to evolve a long neck has been infused into the protoplasm by the creative power according to a prearranged plan. Creative evolution assumes a blind primordial vital impetus without purpose, end or aim. Organic life is an infinite addition, a continuance without conclusion. Creation once started, the long neck has evolved without any previously arranged plan. The Neo-Lamarckian explains the evolvement of the long neck by the continual stretching of the organ to reach the leaves of high trees. The increase in length was transmitted from generation to generation, each generation contributing its quota. In this way the present long neck has been evolved. The Neo-Darwinian assumes an accidental variation. At one time in the animal's history an animal with a long neck has been accidentally bred. This variation with its higher survival value survived during a scarcity of food while the low-necked varieties disappeared.

Neither of the four theories gives entire satisfaction to the fastidious critic. The mechanistic theory denies or rather ignores the presence of an intelligence in the universe, and the human mind, as now constituted, cannot understand how the power, that could create a substance with the potentiality to develop into the human intellect, could itself be devoid of intellect. If, on the other hand, the creative power is endowed with intelligence, then its working without aim or purpose is equally unthinkable. The vitalistic theory offers other difficulties. Teleology does not answer the question why an intelligence, unlimited by space and time, omnipotent and omniscient, should need the vast machinery of evolution to accomplish its end; why could it not create a full-fledged Adam of the theologist? Moreover, the human mind cannot grasp the How, the Whence and the Where of the supreme intellect except by faith, and science has no dealing with faith. The same objection may be raised against creative evolution, whence this initial vital impetus, whence this original life.

The part of the mechanistic theory enunciated by the Neo-Lamarckians seems quite probable. Nurture or environment does sometimes change organic beings either by chemical or by physical influences, and these changes are not seldom transmitted to the offspring. Antonio Marro (First Eugenic Congress) cites a case where a bull while leaving the stable had his tail cut off, the door suddenly closing; all the calves born through the impregnation of this bull were tailless. Marro also made guinea-pigs epileptic by the resection of the sciatic nerve, and the offspring of the animals

were also epileptic. Climate, temperature, moisture, nutrition, and unusual activity produce effects upon the organism, and the offspring of the new generation have in their blood and brain the consequences of the habits of their ancestors. High temperature changes the color of insects which is then inheritable or racial. Poisons such as alcohol, syphilis, arthritic diathesis, intoxicants of contagious diseases do also change the germ-plasm. Prolonged disuse of an organ causes its degeneration and often its disappearance. On the other hand, many facts tend to show that acquired characteristics, as a rule, are not transmitted to the offspring. Since the beginning of history circumcision has been practised among the Jews, still every Jewish boy is born with an intact prepuce.

For the reason that in the majority of cases acquired characters are not transmissible, the Neo-Darwinian rejects the explanation of evolution by appetency or the use and disuse of certain organs, and assumes a quasi *deus ex machina* in the form of variation.

Ordinary variation is a fact not to be disputed. No two plants or animals are exactly alike. The amphimixis or the blending of the inheritances of two individuals is, according to Weismann, the great factor in the production of variations. The two parents of every animal or plant have the species-character in common, but there are certain distinctive traits that hybridize. Hence, ordinary variation is a fact, and Nature by selection may evolve, in a slow way, new species, just as Luther Burbank creates new kinds by artificial selection. Favorable variations are then bound to furnish the possessor with a greater power of resistance and with higher possibilities of life and propagation. Evolution accordingly occurs primarily through sudden mutations or sports which are the fittest for survival.

While the principle upon which the Lamarckian doctrines rest is the power of adaptation, the basis of evolution for the Darwinian is the transmissibility of unlikeness or individuality just as likeness. Acquired characters are not transmitted; each generation has to make a fresh start. It does not begin where the last generation has left off. But variations are transmitted to the offspring, and evolution proceeds by the sport or the transilient variation.

A serious objection to this theory is the tendency of Nature to revert to the normal average of the race. The law of Galton means the return to the mean of the species. The children tend to return towards the mean of the race. It is the law of regression towards mediocrity.

Thus the four explanations do not satisfactorily explain, and the whole subject of the method of evolution is yet *sub judice*. Neither teleology with the initiatory psychic energy working towards definite ends, nor Bergson's vital impulse or original profound cosmic force, nor Lamarck's appetency or use and disuse, nor Darwin's natural selection, furnish an unobjectionable satisfactory ex-

planation of the fact of organic evolution, as proved by embryonic evolution and by Hæckel's biogenetic axiom that ontogeny is a short recapitulation of phylogeny.

Still among the adherents of the mechanistic theory the common run of contemporary thought implicitly denies the hereditary transmission of acquired characters. The world's thinkers have generally accepted the privilege of natural selection as the method of evolution. Especially since the discovery of the Mendelian law, the world of science generally attributes the greater importance to heredity than to environment in the evolution of life.

The learned monk Mendel, in his convent garden, made several important discoveries concerning the heredity of living organisms. He first found the quality which he called 'unit-characters.' Unit characters are, in the first place, the characteristics of the species, such as the number of the fingers. Unit characters are controlled by determiners which are either dominant or recessive. Unit characters for this reason do not blend. The color of the hair, for example, is a unit character, and black is the dominant color. Hence, when a black plant or animal is crossed with a white one, the hybrid is always black. The black type predominates in the influence of the hybrid, while the type of white exercises the lesser influence.

The second phenomenon Mendel discovered is that of segregation. By segregation is understood the separation of opposite determiners. Every unripe ovum or spermatoblast, in the hybrid plant or animal, contains, for example, white and black determiners, but the ripe ovum or spermatozoön contains only one kind of determiners, either white or black, that is, during the ripening of the sex-cell into the gamete (a gamete is a sex-cell ready for impregnation) one kind of the determiners has been eliminated.

Segregation, therefore, means that the gamete, or the sex-cell after maturation, has either dominant or recessive determiners, never both. Segregation thus affects the purity of the gametes. The matured ovum and spermatozoön are always pure even in the hybrid animals. Accordingly, when a spermatozoön, with a white determiner, impregnates an ovum with a white determiner, although both originated in black hybrids, the zygote (impregnated cell) will be a pure white. When a black ovum is impregnated by a black spermatozoön, the zygote will be a pure black. If the ovum is black and the spermatozoön is white or the ovum is white and the spermatozoön is black, the zygote will also be black, but a black hybrid. Thus, when two black hybrids are crossed, the dominant color black will be represented by 75 per cent. of the offspring and the recessive color white by 25 per cent. The zygote of two hybrid parents is either pure or hybrid. When the two gametes are similar the zygote is pure or homozygous; when the two gametes are dissimilar the zygote is heterozygous. Hybrids, by the faculty of segregation, produce, in the first generation, 50 per cent. homozy-

gous zygotes (25 per cent. pure whites and 25 per cent. pure blacks) and 50 per cent. heterozygous zygotes (all hybrid blacks). Hence the apparent paradoxical phenomenon that when a pure blond is married to a pure brunette all the children are brunette, while when both parents are brunette, but hybrids, the offspring will be 25 per cent. blond and only 75 per cent. brunette. The blond being recessive can only be homozygous, while the brunette being dominant may be either homozygous or heterozygous.

This law, that the determiner in the protoplasm of the parent cell always fixes the character of the progeny, holds good only of the unit-character. Many individual characters are fluctuations and play no part in Mendelian heredity. Bodily modifications resulting from environing conditions are not Mendelized. Most of the human traits Mendelize, such as stature, span, size of head, shades of color of hair and eyes, hair curliness, pulse-rate, digestion, and the psychic traits, such as determination, cheerfulness, alertness, resistance to fatigue. Some anomalies also depend upon the determiners and Mendelize, such as color blindness, night blindness, albinism, brachydactylism (only two finger-joints), syndactylism, polydactylism, keratosis, hemophilia, cataract, deaf-mutism, imbecility, Hutchinson's chorea, epilepsy, and some forms of insanity.

The Mendelian law was a perfect revelation. The world knew by experience that desirable as well as undesirable traits are transmitted by heredity, but it thought heredity could be controlled by environment. It believed in economic determinism. Mendel's law revealed the inexorableness of the law of heredity.

With the discovery of the Mendelian law eugenics was placed upon a scientific basis. The science of eugenics teaches that nature is stronger than nurture. Inheritance is more vital than environment. The characters of any living being are determined by two factors, heredity and environment. Heredity and education supply a potential figure, both multiplied give something, if one is nothing the result is nothing. But heredity is the weightier factor. If the symbol of inheritance be placed as 1 and the symbol of environment as 0, both together will give the figure 10. Each alone amounts to little, in the one to 1 and to nothing in the other. When nature and nurture compete for supremacy on equal terms, says Galton, the former proves the stronger. It is needless to insist that neither is self-sufficient; the highest natural endowments may be starved by defective nurture, while no carefulness of nurture can overcome the evil tendencies of an intrinsically bad physique, weak brain or brutal disposition.

No degenerate or feeble stock can ever be converted into a healthy and sound stock by environment, such as sanitary surroundings, good laws, education, wealth, etc., as the socialistic and similar doctrines would make us believe. Such means may render individual members of the stock passable or even strong members of society, but the same process will have to be gone through again

and again with their offspring. Improved conditions of life mean better health for the existing population; greater educational facilities mean greater capacity for using existing ability. But lasting improvement can only be secured by breeding from good stock. The present legislative and philanthropic attacks on social evils, being directed against environmental influences, can only have an effect upon the present generation. By transforming the environment into a more suitable habitat and by other social improvements, the actual individuals may be raised from a lower toward a higher group, but the development of the future generations will be little influenced by these improvements, if the conditions of the blood have been neglected. Eugenics extends the function of philanthropy to the future generations.

This does not mean that the improvement of environic influences has no eugenic value. Just as the temporary improvement of the individual's qualities is not inheritable, so is acquired deterioration, except by certain poisons, not transmitted either. The children of the slums make a fresh start where their parents did. Almost 90 per cent. of all the babies of the slums are physically vigorous and promising before environment has made its mark upon them, and in the interest of these 90 per cent. of normal children the care of environment must not be neglected. Qualities which a child possesses may be allowed to wither or may be crushed by offered for the survival of the unfit. A social contraselection has never come to light for lack of a proper stimulus. Hence proper euthenics will have a vast influence upon the greater part of the members of human society.

But concerning the minority, nothing can be brought out from a child by euthenics which is not within it. The elimination of this minority can only be effected by better matings, and it is just this minority of defectives, met with not only in the slums but also in the quarters of wealth, that weighs down the body politic. The aim of eugenics is the elimination of this comparatively small minority. The natural result would be the production of a more healthy, more vigorous and more able humanity. The practical application of the knowledge of heredity would give rise to a race of men sound in mind and body, who would be better able to mold and shape their environment and create a higher civilization. In the last analysis civilization represents the sum of human contrivances which enable human beings to advance independently of heredity and nature.

The aim of eugenics is the production of a better humanity. This may be realized in two different ways, by a positive and negative device. The positive method is the imitation of competent animal breeders who by artificial selection have been able to effect pure breeds in their stocks. The negative way is the prevention of the propagation of those afflicted with undesirable characters.

There are three methods to effect the elimination of the unde-

sirables—segregation, sterilization and castration. In the early history of the human race artificial devices were unnecessary. Natural selection or the survival of the fittest was the most potent factor of the elimination of the weak. Later on in the periods of the Greek and Roman civilizations the exposure of sickly children, famines, epidemics and the lack of hygiene served as the best means of weeding out the weak and the feeble. But as civilization advances a higher ethical level is reached. The diseased, the weak and feeble are allowed to survive. Especially since the appearance of Christianity, which originated among the poor and lowly, charity to the sick, poor, weak and afflicted has become to be considered the first duty of human society. The greatest part of all our charities is in the service of the defectives and the degenerates. The ever-broadening sympathy and altruism of civilized humanity makes it possible for the dependent and delinquent classes to survive. We make the fostering of the unfit and of the cripple our highest duty. Especially in modern times, the great strides made in hygiene and in the other medical sciences operate to prolong the existence of the unfit. War on infant mortality and surgical aid have enabled defectives to become parents. We are trying to make environment safer for the feebler in mind and body. Manifold facilities are offered for the survival of the unfit. A social contraselection has thus set in. All our sentimental activities in the interest of charity, praiseworthy as they are, are in the last analysis antisocial.

Our antisocial perverted sentimentality shows itself particularly in the stand we are taking towards marriage. Marriage and racial antisuicide are preached in and out of season. Almost anybody, the criminal in the Tombs and the deaf-mute in the asylum, is considered good enough to marry and to propagate. The result of this preaching is that the improvident, incontinent, selfish and foolish follow the advice and marry. The less individualized, the lower the types, the more nearly animal, the earlier they marry and the more they are fertile. On the other hand the superior men and women either do not marry at all (*e. g.*, Catholic priests, teachers, etc.) or marry very late and practise the voluntary elimination of the family in the bargain, for the prevention of conception is an accepted principle among the educated classes of every civilized country. Hence the fall of the birth-rate among the most desirable classes, such as the professional people, best artisans, skilled mechanics, etc. This falling birth-rate in itself is not at all a great calamity to humanity, as some reformers and politicians try to make us believe. It may be dangerous to a smaller state when threatened by a more populated one. Otherwise the fall of the birth-rate brings rather benefit than damage to the family and to society. The deplorable thing is that only the superior classes practise the limitation of the family; the inferior classes multiply like rabbits. In this way society is overburdened with the listless and

the incapable. Our reformatories, prisons, asylums and homes for the defective are overcrowded.

The endeavor of eugenics is to restore the former selection of the fit in place of the disastrous selection of the unfit. This eugenics wishes to be effected, not by following the brutal philosophy of a Nietzsche, or by abolishing all charities, or by exposing weak children as practised by the ancient Spartans. The moral law and human sympathy dictate that the children, once born, should be preserved by all known means. But in the interest of the race, such children should be prevented from being born.

This need not be accomplished by abolishing the absolute freedom of selection of marriage mates, as advocated by some pseudo-sociologists in Europe. The freedom to contract even an unsuitable marriage is always preferable to the tyranny of the state directing the personal affairs of its citizens. The first essential for human development is liberty. Liberty is the atmosphere in which character is formed. No one has a right to exclude two freeborn individuals from marriage. This right is inalienable. To exclude such a man and woman from marriage relations would be assaulting the inalienable rights of man which no legislature and constitution may do except by brutal force. But man has no right to injure his own children. The careless or wilful procreation of a vicious progeny is not only a crime against humanity but a wrong to the children who ought to have remained unborn. Hence it is the solemn duty of any couple, if there be a taint in their ancestry, voluntarily to exclude themselves from parenthood. If their mentality does not enable them to exercise such control, society has a right, nay the duty to effect the exclusion in its own interest as well as in the interest of the offspring, who would become a burden to themselves.

This exclusion cannot be realized by laws against marriage of individuals, physically and morally inferior. Such laws are entirely futile in relation to propagation. Only hypocrites or perfect fools do not see it. The sex-urge plays a particular rôle in degenerates. They suffer from a diseased exaggeration of the sex impulse. No laws, except it be segregation, can prevent the seduction of the feeble-minded woman or the rape by the criminal man, and a new generation of deteriorants would arise, marriage or no marriage. The baneful sentimentality or sordid economy which allows moral weaklings to roam at large on parole or suspended sentence can only lead to the breeding of mental and moral cripples. If the number of the undesirable and unfit should be decreased, not the marriage but the breeding of the defectives should be prevented.

(TO BE CONTINUED.)

TENDON REFLEXES AND BONE REFLEXES.*

By DR. J. BABINSKI, of Paris,

Lectures delivered at the Hospital de la Pitié, reported by Drs. Albert Charpentier and J. Jarkowski, and reviewed by the author.

(Translated, with some additions in brackets, by Charles Gilbert Chaddock, M. D., of St. Louis.)

(CONTINUATION.)

Tendon and Bone Reflexes in the Normal State.—Truly speaking, it is not easy to differentiate with precision normal persons from abnormal persons. An individual apparently normal in health may have a bad pathological past, the remains of which are revealed by a careful examination; he is then not a normal person.

Necessarily, we must be satisfied by approximation in this regard. And approximation will suffice if we take a numerous group of individuals who are young, well-made, complain of nothing, and who are capable of an average amount of work, like young soldiers. It is legitimate to consider normal the phenomena that are found in all of them, or that are wanting very exceptionally. With such a procedure, we arrive at the following conclusions: The five reflexes that have been previously considered exist in the immense majority of cases; the absence of one of them should then be considered an anomaly. If formerly another view was entertained, it was due to faulty technique in the investigation.

Very old statistics have established that absence of the knee-jerk is extremely rare [in so-called normal persons].

However, in the case of the reflex of the tendo Achillis, a great error was made. For example, in 1882, Eulenberg declared that this reflex was absent in 80 per cent. of normal individuals. Berger, who examined 1,400 normal persons and published his findings in 1879, concluded that the reflex of the tendo Achillis was absent in 20 per cent. of them. Where the technique I proposed is employed, it is found that the Achilles reflex is never absent [in a normal person]. The results of my work in this regard have been confirmed by many neurologists. Thus Oppenheim writes: "The best method (for examination of the Achilles jerk) is the one proposed by Babinski. Since I use this technique, I have found this reflex absent in normal persons only very exceptionally. I therefore consider absence of the reflex of the tendo Achillis a sign of a pathological state."

Albert Charpentier in his examination, in 1898, of the tendon

*Reprinted from the *Bulletin Médical*, October 19th, 26th, November 6th, 23rd, 1912.

reflexes in 1,200 soldiers, aged from eighteen to twenty-four years, did not find a single instance of absence either of the knee-jerk or of the ankle-jerk.

The reflexes of the upper extremity have been generally considered inconstant. This is Oppenheim's opinion; it is also Berger's, who found the reflex of the biceps absent in 35 per cent. and the brachial triceps reflex absent in 25 per cent. of normal young soldiers. Sternberg, in 1896, stated that the reflex of the biceps is less rarely absent than that of the brachial triceps. In my observation of the reflexes of the upper extremity there are three—the reflex of the triceps, the reflex of flexion of the forearm, and the reflex of pronation—that are as constant [normally] as are those of the patellar tendon and the tendo Achillis.*

Again, if among persons appearing to be in perfect health we choose, instead of the young, those of various ages for examination (I exclude the newborn and very young children), we find that the presence of the five cardinal reflexes is a rule which has very few exceptions. But here the exceptions are more frequent, and this is easily explained: the pathological past becomes more burdened as one advances in life. This fact is clearly shown by an interesting work by Dr. Dupuy, surgeon of the Republican Guards, who examined 2,304 Guards, aged from twenty-two to fifty-four years.**

I add that even in the aged, as well as in the enfeebled, these reflexes usually exist.

If the five principal reflexes are, so to speak, always present in health, the same cannot be said of some other tendon reflexes: adduction of the thigh, flexion of the hand and of the fingers, extension of the hand and of the fingers, abduction and adduction of the hand, etc. In reality, absence of these in the normal state is perhaps only appearance; by employing certain means that would permit perception of very slight reactions, they might be made evident, but with our usual methods of examination they seem often to be absent.

What has just been said of the inconstant reflexes shows that in the normal state there are individual varieties. But this diversity is also found in the constant reflexes, for these are far from having the same amplitude in all persons.

Furthermore, normally, lively tendon and bone reflexes are distinguished from moderate or feeble reflexes not only by the amplitude of the movement provoked but also by divers other characteristics which we shall describe. (a) *The threshold of contraction*, in one whose reflexes are lively, is attained by a blow, the

*At the Congress at Frankfurt, Germany, 1911, Trœmner, of Hamburg, presented statistics almost identical with mine.

**De l'absence des réflexes achilléens et des réflexes rotuliens sans autre signe d'affection du système nerveux (absence of reflexes of tendo Achillis and patellar tendon without other sign of disease of the nervous system). (*Nouvelle Iconographie de la Salpêtrière*, No. 2, 1912.)

intensity of which would be insufficient to cause a reaction in another. (b) In the first, with the same intensity of shock, the reflex movement takes place with greater rapidity and quickness than in the second. (c) While in the second, percussion of the lower extremity of the radius provokes only apparent contraction in the flexor muscles of the forearm, in the other (with lively reflexes), besides the reaction of the flexors, we note contractions in other more or less distant muscles, in the deltoid, for example. The extent of the territory of motor reaction is, therefore, variable. (d) In the person having feeble reflexes, we obtain flexion (of forearm) by percussion of a rather limited zone (place of election); in the one having lively reflexes, the reflex may be provoked by percussion of a surface much more extensive—by percussion of various parts of the forearm, even of the carpal region. The extent of the reflexogenous zone is, therefore, also variable.

There is still another point to be noted: if in the same individual the tendon reflexes of different parts of the body are ordinarily of similar intensity, they are far from being so in all cases. The tendon reflexes of the lower extremities may be lively while those of the upper extremities are feeble; so even the different reflexes of the same limb sometimes show unequal intensity, the reflex of flexion being, for example, much more lively than that of extension, or inversely.

It is important to be familiar with these individual differences; and I cannot urge too strongly that the student examine systematically a large number of normal persons in order to learn the whole scale of the normal reflexes before beginning the study of pathological reflexes.* Owing to unfamiliarity with these variations many errors have been made, on which I shall lay stress when I discuss 'epileptoid trepidation of the foot.'

But in contrast with this variability, which it seemed necessary to emphasize, the tendon reflexes have certain elements of fixity. If percussion of one of the points of election for the induction of one of the five cardinal reflexes sometimes provokes, besides the constant reflex, one of the inconstant reflexes before indicated, the latter is never greater in intensity than the former. For example, if, in a normal person, percussion of the lower extremity of the radius causes flexion of the hand and of the fingers, this flexion is usually less marked than the flexion of the forearm on the arm, or, at least, does not predominate. We shall return to this point and show its importance in relation to 'inversion of the radial reflex.'

*In order to judge the condition of the tendon reflexes with the precision which the physicists employ in their work, to measure the intensity of excitation and that of reactions, the duration of the latent time, etc., recourse has been had to the graphic method, and various forms of apparatus have been devised. Recently, Piéron presented to the Société de neurologie (*Revue neurologique*, 2nd semestre, p. 398, 1910: La notion de l'exagération du réflexe patellaire et la réflexométrie) a very ingenious reflexometer with which he made a very delicate physiological analysis of the knee-jerk. But if such means may be employed in laboratory research, they are hardly practicable in clinical work.

Another character of fixity, the interest of which is much greater, should be enunciated in the form of a law.

The Law of Symmetry.—Normally the reflexes of the right side are equal to those of the left side. Without doubt, normally, as I have said, the reflex of flexion of the fingers and of the hand, the reflex of extension of the fingers, etc., may be wanting in a healthy person, but they are then always absent on both sides; if one of these is absent on one side but present on the other, then we are dealing with a pathological condition.

Localization of the Centres of the Tendon and Bone Reflexes.—A few words about the localization of the centres of the tendon and bone reflexes: As we shall see when we come to pathology, study of the reflexes gives us indices not only of the nature of diseases, but also concerning the seat of lesions that affect the reflex arcs.

It is admitted that each muscle is innervated by several roots (usually by three) and that it is consequently dependent upon several medullary segments.

Actually, we do not know in what measure the participation of various segments is necessary for the production of the reflex phenomenon; nevertheless, the notions already established have a really practical value: they enable us to locate sometimes cord lesions with an approximation that suffices for clinical purposes. In the following table will be found the facts we possess concerning the localization of the principal reflex centres.

TABLE I.
Localization of Tendon and Bone Reflex Centres.

<i>Reflexes</i>	<i>Points of Excitation</i>	<i>Reacting Muscles</i>	<i>Reflex Centres*</i>
Masseter	Lower jaw	Masseter	Pons
Scapular	Edge of scapula	Deltoid [?]	4th cervical segment.**
Radial; flexion of forearm on arm.	Tendon of biceps; lower extremity of the radius.†	Biceps, Brachialis anticus, Supinator longus.	5th cervical segment.
Pronation	Lower extremity of the radius or the ulna (percussing to give shock in the sense of supination).	Pronators	6th cervical segment.
Extension of forearm	Tendon of triceps; lower third of ulna.	Triceps	7th cervical segment.
Flexion of hand and fingers	Wrist	Flexors	8th cervical, 1st dorsal segments.
Knee-jerk	Patellar tendon	Quadriceps	3rd lumbar segment.
Ankle-jerk	Tendo Achillis	Triceps sural	1st sacral segment.

*For the spinal centres, here are indicated the segments which seem to predominate.

**[The reflex movement excited by percussion of the spinal border of the scapula, Bechterew's, does not seem to be caused by contraction of the deltoid,

These localizations, which, taken separately, may be destined to undergo some corrections, seem to be exact with relation to the order of succession of the centres of the tendon reflexes from the pons to the sacral portion of the cord.

Pathological States of the Tendon and Bone Reflexes.—In general, disturbances of tendon and bone reflectivity are caused by two kinds of lesions: lesions of one sort have their seat in one of the three elements of the disturbed reflex arc; lesions of the other kind involve a region higher up in the nervous system and act on the lower arc in an indirect way. Ordinarily, lesions of the first variety cause subreflectivity or irreflectivity, while those of the second kind produce surrefectivity.*

Subreflectivity; Irreflectivity.—These disturbances, as just explained, are usually due to some alteration of one of the three elements of the primary reflex arc: (a) the centripetal path (sensory nerve, posterior root); (b) central element (gray substance); (c) centrifugal path (anterior root, motor nerve, muscle innervated by this root and this nerve).

The Features that Make Possible Recognition of Irreflectivity and Subreflectivity; Causes of Error.—With reference to irreflectivity [abolition of reflex action], with lack of experience, there is danger of making two kinds of mistake: (1) of regarding a reflex that is simply feeble or normal as absent, (2) as present, a reflex that is abolished. The gravity of such an error is proportionate to the clinical value of the symptom in question.

Erroneous observation positing irreflectivity has several possible sources:—

(a) Some persons, having had their reflexes examined, and who know what is expected when the tendons are struck, almost unconsciously, when the blow is delivered, execute a voluntary movement which might be taken to be due to a reflex contraction. In such a case one might be deceived if the reflex examined happened to be

at any rate alone; the predominating reflex movement thus induced seems to be due to excitation of an external rotator of the humerus and an adductor; in pathological conditions the deltoid may be simultaneously excited. This reflex is very constant in health. The question of its being of idiomuscular nature seems settled in the negative.]

†[No ordinary blow of the percussion hammer can excite the biceps alone; to accomplish this, the examiner may with the point of the thumb find the tendon just above its lower insertion, and keeping the point of the thumb on the tendon the blow of the hammer may be delivered on the distal joint of the thumb and thus will be unerringly directed on the tendon of the biceps. This procedure excludes the brachialis anticus and the supinator longus.]

*At times the terms hyperreflectivity or hyperreflexia, hyporefectivity and areflectivity are used to designate exaggeration, diminution and abolition of the tendon reflexes. Since these words are taken from two radicals, one of which is Latin and the other Greek, they are, from the linguistic point of view, badly composed. Here I employ the terms subreflectivity, irreflectivity, and surrefectivity, formed of a French word derived from the Latin and prefixes taken from the same language, to designate, respectively, enfeeblement, absence, and exaggeration of the reflexes. [This explanation has the same force in the English translation that it has in the original French.]

absent.* However, it is easy to distinguish the true reflex from the false reflex. Aside from the fact that the form of the latter is not identical with that of the former, which, in truth, is a matter requiring delicate appreciation, the time elapsing between the percussion and the reaction is often much longer than that which elapses in the case of a true reflex movement, and the time varies in repeating the experiment; moreover, the intensity of the contraction also undergoes notable variations in a series of successive examinations [blows at the same sitting]. These characteristics are especially clear when the patient is examined with the eyes blindfolded.

(b) In examining the reflex of the brachial triceps, if the aim is bad, the blow, instead of being given immediately above the olecranon on the tendon, may strike the muscle, and thus excite an idiomuscular contraction which might be taken for a reflex movement. A similar error may be committed, when, examining the reflex of flexion of the forearm on the arm, an attempt is made to percuss the biceps tendon. It suffices to know this source of error in order to avoid it.

(c) Finally, I must point out another cause of confusion. Especially in certain paraplegics, we observe, as a result of excitation of the skin of the lower extremities, reflex movements which are what are called 'the cutaneous reflexes of defense,' and which I shall later consider. These reflexes of defense sometimes coexist with enfeeblement or abolition of the tendon reflexes. In such a case percussion of the patellar tendon causes indirectly, through excitation of the skin in the zone of the quadriceps tendon, a movement which a superficial observer might mistake for a tendon reflex; this is the 'pseudo-knee-phenomenon' of Westphal.

But with very little attention, one does not risk making such a mistake: the reflex movement of defense, in a pathological condition, is usually slower and of longer duration than the tendo-reflex movement; it involves other groups of muscles than those of the domain of the tendon reflex; and, finally, the reflexes of defense can usually be provoked by excitation of various parts of the lower extremities.

Thus it is easy enough to avoid this first kind of error.

Error of the second kind is extremely common. Many times have I been consulted by persons in perfect health whom their physicians had treated as tabetic, because the physicians had thought that they had found the knee-jerks absent. Such an error is due to failure to observe the rules that must be followed in examination of these reflexes and which I have already given.

I must confess that, in spite of my experience in the examination

*[A case in point is that of a physician, who under examination invariably executed the movement of the ankle-jerk voluntarily, though both ankle-jerks were absent; he did not wish to know he had tabes, and his dissimulation was practised only in obedience to that desire.]

of reflexes, I am sometimes obliged to devote several minutes to a single reflex in order to be certain about it. Therefore, I cannot too strongly advise those not thoroughly familiar with neurological work to be circumspect, and, if need be, to make several examinations before giving a definite opinion.

I would call attention here to a procedure which has enabled me in some cases to cause a tendon reflex to appear which had seemed to be abolished: it consists of a few rapidly repeated blows of the hammer on the muscles controlling the reflex under examination.

Whenever the absence of the reflexes described, or even of one of them, has been clearly established, it may be affirmed immediately that an abnormal condition exists; this follows from the facts furnished by physiological study of the reflexes. But it is more difficult to determine the degree of intensity below which one is justified in declaring that subreflectivity exists. Upon what criterion can one base this opinion?

Two categories of facts should be considered:—

(a) The tendo reflexes are feeble on both sides, and also more feeble on one side than on the other. Interpretation of such a case is simple. The asymmetry alone indicates a pathological state. It remains to determine whether this asymmetry is associated with an exaggeration of the tendon reflexes of one side, or due to diminution of the reflexes of the opposite side. The state of general diminution of the reflexes does not permit us to accept the first idea, and we are thus forced to entertain the second.

Leaving out of account the degree of intensity of the reflexes, we may determine easily whether their inequality depends upon subreflectivity or upon surrefectivity when unilateral functional disturbances coexist. It goes without saying that in such a case the reflexes of the abnormal side should be considered to be enfeebled or exaggerated, depending upon whether they be feeble or lively by comparison with the opposite side.

(b) The reflexes are feeble and equal on the two sides. Here, have we to do with physiological weakness or with pathological reduction? If the enfeeblement be very marked, and if, besides, there be the phenomenon of 'exhaustion'—successive blows causing muscular reaction more and more feeble—we could not hesitate to recognize a pathological state. If the enfeeblement be less marked and the phenomenon of exhaustion be lacking, it will be more difficult or even impossible to draw a just conclusion. Here the matter becomes a question of impression, with a greater chance that the impression will be correct, if the examiner has made a profound study of tendon reflexes in the normal state. But it should be said that usually when there is real subreflectivity, perfect symmetry is exceptional, and only very rarely is it impossible to solve the problem.

Various Modes of Subreflectivity and of Irreflectivity.—Subreflectivity or irreflectivity may be general or local; there will be occasion later to indicate the more common varieties in this respect.

When irreflectivity is partial, it may cause a transformation of movements due to percussion of tendons and bones. Thus, the blow on the tendon of the triceps brachialis, when the reflex of extension of the forearm is weakened or abolished, may cause flexion of the forearm on the arm. This is the paradoxical reflex of the elbow. I interpret this phenomenon as follows: normally, percussion of the lower extremity of the humerus occasions flexion of the forearm, except when the blow is delivered at the level of the tendon of the triceps, the effect of excitation of this tendon predominating over those that result from vibrations set up in the underlying bone. In disease, when the reflex of extension is enfeebled or abolished, the reflex movement of flexion appears, even when the blow is given on the tendon of the triceps.*

It has been said that percussion of the lower extremity of the radius always normally provokes flexion of the forearm on the arm. This is sometimes accompanied by flexion of the hand and of the fingers; but the latter movement, in a normal person, is usually of an intensity lower than the intensity of the flexion of the forearm on the arm, and it is never greater. But diminution or abolition of the reflex of flexion of the forearm, a pathological state, may have as a consequence that percussion of the lower extremity of the radius causes flexion of the hand and of the fingers of greater intensity than the flexion of the forearm; or the latter may not occur. This phenomenon I have described under the term 'inversion of the radial reflex,'** the reality of which has been confirmed by numerous observers.

We may conceive other combinations which might give rise to other modes of inversion. Marie and Barré have called attention to what they call *inversion of the ulnar-pronator reflex*.

Tendon reflexes diminish or disappear either suddenly or gradually. Irreflectivity continues indefinitely or diminishes. It is accompanied by other symptoms which precede or follow it, or it may be the only manifestation of a pathological state. In fact, except for hypotonia which is its usual consequence, abolition of the tendon reflexes in itself produces no functional disturbance: a person deprived of all the tendon reflexes need not experience any discomfort; this is true in many cases of veiled tabes. This is a phenomenon which has capital diagnostic value, but which causes no inconvenience, and which, moreover, does not necessarily give any measure of the gravity of the affection with which it is associated.

Affections Which Produce Irreflectivity or Subreflectivity.—(Lesions which involve the arcs of the tendon reflexes.) I shall now review the principal diseases which engender irreflectivity. I might adopt a methodical order and examine successively such affections, commencing with those which implicate the peripheral

*See *Revue neurologique*, 1st semestre, p. 511, 1911.

**See *Bulletins et Mémoires de la Société Médicale des Hôpitaux*, Vol. CXXX, 3rd Series, p. 185, 1910.

portion of the centripetal path of the reflex arc, to arrive at lesions involving the periphery of the centrifugal path; however, I prefer a classification which, though less physiological, seems more clinical.

From this point of view, the diseases in which are observed irreflectivity may be classed in two groups. In the first group are three diseases for the diagnosis of which absence of the bone and tendon reflexes constitutes a symptom of prime importance. These are tabes, neuritis, and anterior poliomyelitis. I may add to this pathological triad Friedreich's ataxia, but by reason of its rarity, give it a secondary place. In the second group, I place all the affections in the symptomatology of which, irreflectivity, though important, is not usually of prime importance. Here, then, come diffuse and transverse myelitis, compression of the spinal cord, syringomyelia, etc.

FIRST GROUP.

Tabes.—Let us first consider the disease of Duchenne, in which, as has been said, abolition of the knee-jerk was first pointed out by Westphal in 1875. This author, in 1881, again studied this question in more detail, and he established the fact that abolition of the knee-jerk is sometimes a precocious sign of locomotor ataxia. This symptom extended considerably our knowledge of the disease of Duchenne, and permitted its recognition in many cases where formerly it would have remained unrecognized.

The knee-jerks are not the only tendon reflexes that may be affected in tabes; all may be abolished.

It may even be said that among the absent tendon reflexes, Westphal's sign does not occupy the first place; that place belongs, as I have shown, to the absent reflex of the tendo Achillis. It is true that this phenomenon had been previously noted in a few cases of tabes, but no importance was attached to it, because absence of the ankle-jerk was considered frequent in health.

However, after showing that this reflex is constant, so to speak, in the normal person, I was able to appreciate its abolition.* I became convinced that this symptom is very frequent in tabes, that it generally precedes abolition of the knee-jerk, and that it has a preponderating value in the diagnosis of the disease of Duchenne at its beginning. This, moreover, seems logical when it is understood that the lesions of tabes usually follow a kind of upward progression, beginning in the lowest spinal roots. These ideas have been accepted by the majority of neurologists (Erb, Biro, Goldflam, Saeger, Oppenheim, and others).

Occasionally crossed abolition of these two reflexes (ankle-jerk

*Sur le réflexe du tendon d'Achille dans le tabes, par J. Babinski, *Bulletins et Mémoires de la Société méd. des hôpitaux*, p. 679, 1898.

Sur le réflexe du tendon d'Achille, par J. Babinski, *Revue neurologique*, p. 482, 1901.

and knee-jerk) is observed; in fact, not infrequently, we find on one side abolition of the ankle-jerk with the knee-jerk present, while on the other side, inversely, the ankle-jerk is present and the knee-jerk is abolished.

The reflexes of the upper extremities in tabes were studied in 1901 by Fränkel (*Revue neurologique*, p. 245, 1901). According to this observer, abolition of the reflexes of the upper extremities usually precedes irreflexivity in the lower limbs, and is a precocious sign of tabes. This idea is inexact. The error was probably due to imperfection of technique in the examination of the reflexes of the arms. When examined according to the method I have here indicated, they are found to be present in a large number of cases in which the reflexes of the lower extremities are abolished. The inverse condition is extremely rare. It is nevertheless true that at a certain stage of the disease the reflexes of the upper extremity weaken and disappear in turn in many patients. Usually, in such cases, the disturbances follow an upward progression, the reflex of extension of the forearm more frequently disappearing before that of flexion. In such a case, percussion of the tendon of the brachial triceps usually provokes what we have termed 'the paradoxical reflex of the elbow.'

Before disappearing, the reflexes pass through a stage of enfeeblement, and this weakness is usually asymmetrical; Goldflam has insisted on the inequality of the knee-jerks (*Neurologisches Zentralbl.*, p. 529, 1888). I would have you note that the major part of the manifestations of tabes appear, at least at a certain period of the disease, in an asymmetrical form.

We have seen, then, that irreflexivity may become general. Sometimes, on the contrary, it remains localized at a single level, and then usually at the tendo Achillis, ascending no further.

In some cases, the irreflexivity, even after it has invaded several reflex mechanisms, remains indefinitely the only clinical manifestation of tabes. Other forms of the disease are characterized by lightning pains, gastric crises, laryngeal crises, optic atrophy, etc., while the tendon reflexes are but little or not at all implicated. However, there is a tabetic disturbance, the most prominent of all, ataxia, which seems to accompany necessarily tendon irreflexivity.

In the disease of Duchenne, after having been abolished, can the tendon reflexes reappear? Return is certainly very rare in pure tabes; but it is less so when tabes becomes complicated with hemiplegia (Goldflam, Jackson and Taylor, etc.). We shall return to this point when we come to the consideration of the association of lesions, some of which increase and others of which decrease the tendon reflexes.

(TO BE CONTINUED.)

MEDICAL AND SURGICAL PROGRESS.

ENURESIS NOCTURNA.

A REVIEW OF RECENT LITERATURE.

By HUGO EHRENFEST, M. D., of the Editorial Staff.

1. Allaria: Epidural Injections in Enuresis of Children. (*Gazz. degli ospedali e delle cliniche*, Milan, April 20th, 1909. Abs. *Journ. Amer. Med. Assoc.*, p. 1896, June 5th, 1909.)
2. Boinville: Causes and Treatment of Nocturnal Enuresis. (*Practitioner*, p. 396, March, 1906.)
3. Burkhardt and Polano: Untersuchungsmethoden, etc., der Harnorgane. 1908.
4. Cahier: Treatment of Essential Enuresis Nocturna. (*Archiv. de méd. et de pharm. militaire*, June, 1909.)
5. Cantas: Treatment of Enuresis Nocturna by the Epidural Method. (*Muench. med. Wochenschr.*, p. 1943, October 25th, 1904.)
6. Firth: Enuresis and Thyroid Extract. (*Lancet*, p. 67, January 6th, 1912.)
7. Frankl-Hochwart and Zuckerkandl: Die nervösen Erkrankungen der Harnblase. 1906.
8. Hart and Barbour: Manual of Gynecology. Sixth Edition. 1905.
9. Henoch: Kinderkrankheiten. 1897.
10. Herman: Diseases of Women. 1913.
11. Hofmeier: Handbuch der Frauenkrankheiten. 1913.
12. Kapsamer: Treatment of Enuresis Nocturna with Epidural Injections. (*Wien. klin. Wochenschr.*, No. 30, 1903.)
13. Klotz: Treatment of Enuresis Nocturna. (*Deutsch. med. Wochenschr.*, No. 49, p. 2297, 1912.)
14. McGirk: Enuresis in the Female Due to Phimosis. (*Surg., Gynec. and Obstet.*, November, 1907.)
15. Mello-Leitao: Treatment of Nocturnal Enuresis in Children. (*Pediatrics*, Vol. XXV, p. 27, 1913.)
16. Morris: System of Gynecology by Allbutt, Playfair and Eden. 1906.
17. Peritz: Enuresis and Myelodysplasia. (*Deutsch. med. Wochenschr.*, July 6th, 1911.)
18. Perrin: Concerning Enuresis Nocturna. Dissertation. Lausanne. 1906. (Abs. *Zentralbl. fuer Gynaekol.*, p. 1491, 1908.)
19. Rey: Enuresis in Children. (*Berl. klin. Wochenschr.*, No. 35, 1904.)

20. Rotch: Pediatrics. 1912.
21. Ruhräh: Treatment of Nocturnal Enuresis in Children. (*Amer. Journ. Med. Sciences*, Vol. CXLIII, p. 185, 1912.)
22. Sieber: Treatment of Enuresis Nocturna by Means of Epidural Injections and Experiments Concerning the Etiology of This Disease. (*Zeitschr. fuer gynaeol. Urologie.*, Vol. I, p. 213.)
23. Simpson: Incontinence of Urine in Children. (*Edinburgh Med. Journ.*, Vol. X, p. 49, 1913.)
24. Sisto: Epidural Injections in the Treatment of Essential Incontinence. (*Ann. de méd. et chir. inf.*, March 1st, 1910; *Abs. Journ. Amer. Med. Assoc.*, July 2nd, 1910.)
25. Still: Enuresis and Fecal Incontinence in Children. (*Clinical Journ.*, London, April 24th, 1907; *Abs. Journ. Amer. Med. Assoc.*, p. 90, July 6th, 1907.)
26. Stöckel: Sacral Anesthesia. (*Zentralbl. fuer Gynaekol.*, p. 1, 1909.)
27. Taylor: Treatment of Enuresis in the Female. (*British Med. Journ.*, Vol. I, p. 509, 1902.)
28. Thursfield: Enuresis and Its Treatment. (*British Med. Journ.*, April 21st, 1906.)
29. Trembur: Roentgenological and Cystoscopical Findings in Enuresis Nocturna of Older People. (*Med. Klin.*, No. 37, p. 1494, 1913.)
30. Vietinghoff-Scheel: Therapy of Enuresis Nocturna. (*St. Petersburg med. Wochenschr.*, No. 35, p. 359, 1906.)
31. Wachenheim: Enuresis. (*New York Med. Journ.*, February 5th, 1910.)
32. Walko: Treatment of Enuresis. (*Zeitschr. fuer diätet. und physikalische Therapie*, Vol. VI, 1902.)
33. Williams: Adenoids, Nocturnal Incontinence and Thyroid Gland. (*Lancet*, May 1st, 1909.)
34. Zangger: Treatment of Functional Enuresis. (*Correspondenzbl. Schweizer Aerzte*, No. 18, 1907; *Abs. Journ. Amer. Med. Assoc.*, p. 447, August 13th, 1913.)

For the purpose of a critical review, recent contributions to the question of enuresis nocturna may conveniently be divided into two main groups—the one, comparatively small, comprising investigations into the etiology of this condition, the other, by far the larger, dealing with the therapeutic side of the problem.

It would be difficult to summarize the views expressed by the writers of the first group. The actually existing or at least apparent disparity of opinions would seem to render such a task almost impossible. And, nevertheless, much of the seeming diversity of views probably is due to the absence of any exact definition of the term enuresis nocturna as used by the various writers. In its broadest meaning it is often applied to all observations of bedwetting during the night in children older than approximately three years, the age at which the normal child usually has acquired the ability of controlling detrusor and sphincter function during sleep. It is, therefore, often stated as important in a differential diagnosis that the child must have passed through a period of perfect control, but even this limitation is omitted by other writers. Usually the fact

is emphasized that in cases of enuresis nocturna the urine is expelled in quantities at a time, and not dribbling continuously. These are practically all the characteristic features accepted by most of the writers in defining this disease, thus summarizing under this condition a great variety of very different pathological conditions.

A striking difference then becomes obvious when we see Frankl-Hochwart and Zuckerkandl, two recognized authorities, define enuresis nocturna as a neurosis observed in children between three and fourteen years old, who do not exhibit any signs of anatomical anomalies to explain the condition. Or quoting from the splendid book of Burkhardt and Polano: "Enuresis nocturna during childhood is a neurosis. In this particular type of urinary incontinence should not be included cases of deficient bladder control due to diseases of the spinal cord or the brain, nor incontinence as observed in such neuroses as epilepsy, or bedwetting so commonly seen in children suffering from diabetes mellitus or insipidus, or from chronic nephritis."

In one of the recent and most thorough studies of this question by Ruhrah, we may read: "As our knowledge of the subject has increased, the idiopathic cases have gradually diminished in number, and Bazy aptly remarked, that essential enuresis means essential ignorance. Enuresis is a symptom and its underlying cause should be diligently sought."

In our present state of knowledge we possibly must admit that enuresis nocturna can mean only a symptom. This fact satisfactorily explains the existence of so many theories concerning its causation and the multiplicity of therapeutic methods, and characterizes as futile the attempts of too many writers to discover the one cause and the one successful therapy of this condition.

Keeping in mind these three possible interpretations of the term enuresis nocturna—namely, as comprising all types of nocturnal incontinence, as limited only to a specific neurosis, and finally as representing but a symptom, the different views concerning its etiology to be quoted in the following pages will seem less incongruous.

In a prize essay, Boinville grouped the causes according to the various divisions of the nervous apparatus controlling the normal function of the bladder.

The bladder is supplied by two distinct nerve systems, the spinal and the sympathetic. The former is represented by spinal centres in the third or fourth segments of the lumbar enlargement, and its nerve fibres enter the base and neck of the bladder by the third and fourth sacral nerves of the sacral plexus on each side. The sphincter vesicæ, therefore, is supplied by these nerves. The sympathetic system consists of nerve fibres, which, intercommunicating in the pelvic plexus with each other, and with the spinal nerves, supply numerous branches to the upper part of the bladder. The reflex arch is established by sensory nerves, which enter the spinal cord

in the usual manner and communicate with the spinal centres in the lumbar enlargement. These nerve systems, while they are concerned in relaxing or maintaining the contraction of the sphincter and muscular wall of the bladder, may in turn be inhibited or stimulated by nerve fibres of the upper neuron-system, whose centres are in the cortex of the brain. Attention also must be called to the connection between the fibres of the sympathetic, mentioned above, and the sympathetic system generally, which communicates in turn with the spinal nerves of a higher level, and apparently with some of the cerebral nerves derived from nuclei of the medulla. The muscular layer of the urethra is similarly innervated.

The causes of enuresis nocturna then may be grouped as follow:—

(a) *Lesions and Anomalies in Bladder Structure.*—Weakness of muscles as hereditary or congenital defects, or more frequently as part of a general debilitated condition. In children this weakness is the most potent factor.

(b) *Lesions Involving the Peripheral Termination of Sensory Nerves.*—Threadworms in rectum, inflammatory conditions on external genitalia, phimosis, adherent prepuce, constricted meatus, eczema, ulcerations, masturbation and inflammatory conditions in bladder. (Lying on back causes more pressure against the trigonum by weight of collected urine, but the pressure exerted between heavy bedclothes and sacrum may contribute to the accident.)

(c) *Lesions Involving the Peripheral Trunks or Fibres of the Nerve Mechanism.*—Overloaded rectum causing pressure against sacral plexuses as well as upon the bladder itself; pressure from tumors.

(d) *Lesions Involving the Spinal Nerve Centres and Tracts.*—They usually cause a general and but rarely a nocturnal incontinence.

(e) *Lesions Involving Higher Nerve Centres in Cortex of Brain.*—Nocturnal epilepsy; deep sleep such as occurs in children suffering from postnasal adenoids, or hypertrophied tonsils; hysteria, neurasthenia and dreams. Chorea more often causes general incontinence, as do localized organic brain lesions and also insanity. In this group also belong those apparently idiopathic cases, generally connected with an inherited tendency.

Boinville states: "Nocturnal enuresis is not *per se* a disease, but a symptom, and, therefore, first its cause must be diagnosed." His very lucid distribution of all the possible causes into five groups, however, has not enabled even him to 'diagnose' the cause in every instance. His paper, like so many others dealing with etiology, does not attempt to discuss therapeutics in the same exact and diagrammatic form, assigning to each cause one proper form of treatment, but simply enumerates the numberless therapeutic suggestions approximately in the order in which they ought to be tried in the individual case.

Another very thorough study of the latest contributions concern-

ing the physiology of bladder function has been published quite recently by Sieber. From facts now generally accepted and a series of animal experiments made by him, he concludes that any persistent irritation affecting any portion of the sympathetic system may find its final expression in a general state of excitation (hypertonia), which in some cases leads to enuresis nocturna. In this way the frequent coincidence of enuresis with intestinal parasites or with adenoids, etc., can easily be explained. Such a view, at least partially, seems in harmony with the opinion of Jaboulay and others who assume a state of increased irritability in the sacral system.

A more general conception of the causation of nocturnal incontinence is described by Cabot as follows: In babies the detrusor muscle is stronger than the sphincter, and, as a result, when the bladder fills up it overflows. When the child reaches the age of two years, usually this relation by proper teaching has gradually changed so that the sphincter is stronger and prevents the detrusor from contracting and emptying the bladder involuntarily. As the bladder fills, the sensory nerves of the bladder mucosa transmit impressions to the brain, which, in turn, through the bladder motor nerves connecting with the sphincter muscle, cause increased tonicity to resist the detrusor. In cases of bedwetting in the child the sphincter has insufficient resistance. A very acid urine may unduly irritate the detrusor and thus may be the cause of an enuresis, just as exposure to cold may aggravate the condition. Frankl-Hochwart and Zuckerkandl, already quoted, also believe that in true cases of enuresis the etiological factor is found in a reduced tonicity of the sphincter: "A detrusor irritation, so slight that it is not perceived by the sleeping child, leads to sphincter relaxation with escape of the bladder contents. We must remember that the neuropathic child often sleeps uncommonly sound." These writers feel that the sphincter condition must play an important rôle in the etiology of enuresis, because the older theories, assuming simply that sound sleep prevents perception of desire to micturate, could not explain the comparative rarity of this condition. They are, however, willing to accept for certain cases the explanation offered by Janet and others, to the effect that the one additional and uncommon factor leading to nocturnal enuresis may be found in a pollakiuria or in the psychic influence of a dream, the latter possibly being the result of the increased urinary desire caused by the existing pollakiuria.

A combination of opinions, already alluded to, is found in Rotch's idea, that the causes which produce enuresis may act in two ways: either directly on the centres in the lumbar cord, making them more irritable or unstable, and in that way increasing their reflex irritability, or indirectly, through exaggerated reflex causes that affect both acceleratory and inhibitory influences sent to the bladder. These influences may be psychic, originating in the brain, or may be the result of external irritation originating in or near the bladder itself. There is also during childhood a lack of develop-

ment of the centres of inhibitory reflex acts, and in this way the muscular fibres of the bladder, having no inhibitory restraint, are excited to action even by so slight a reflex cause as a small quantity of urine. For this reason enuresis is a normal condition during infancy, and ceases when the child's inhibitory mechanism is more developed (Soltmann). The inhibitory influence of the will is in abeyance during deep slumber, and nocturnal incontinence, therefore, is more common than diurnal.

Herman is among the advocates of the theory that enuresis is only a neurosis. This condition, in his belief, appears to be due to irritability of the spinal centre which presides over micturition. It is a nervous disease, not one depending on any condition of the urinary apparatus. It often runs in families, sometimes is inherited; and a tendency to other nervous diseases, such as migraine, epilepsy, insanity, hysteria, etc., will often be found in the family of the little patient. Herman's views are well characterized by the following sentence: "Nocturnal enuresis is said to be produced by reflex irritation." He advises to look for the possible cause of the existing irritability of the spinal centre, and mentions overexertion as one among them.

A quotation from a very recent paper by Trembur will show impressively not only the variety but also the subtlety of difference in the theories advocated by different authors. Very briefly stated, the etiological factor, in the opinion of the author, is as follows:—Tienhoven: weakness of sphincter; Kœter: weakness of sphincter and also of musculus compressor urethræ; Guyon, Frankl-Hochwart, Zuckerkandl and others: decreased tonus of sphincter; Ultzmann, Czillag and others: misproportion in development of detrusor and sphincter with insufficient innervation of the latter; Bokay and Casper rather similarly believe in a difference in the innervation of detrusor and sphincter; Bendix differentiates a paralytic form with weakness of closing mechanism of bladder and a spastic form with tetanic state of detrusor due to reflectory stimulation; Kuttner: in some cases a reflectory spasm of external sphincter usually the result of habitual retention of urine; Trousseau: abnormal irritability of detrusor; Riedtmann: excessive contractility of detrusor with weakness of sphincter and compressor urethræ accompanied by reduced sensibility in bladder neck; Dittel: in boys, deficient development both of prostate and internal sphincter muscle.

Turning to those writers who consider enuresis nocturna a functional neurosis on a hereditary degenerative basis, we can summarize the theories of those not yet quoted as follow: Oppenheim: a hypersensibility of sympathetic nervous system consisting in a faulty regulation of the sympathetic centres, both spinal and central; Pfister: enuresis is the stigma of a neuropathic diathesis; Czerny, Thiemisch and others: part of hysteria of childhood; and,

finally, in the opinion of Siegmund Freud, a symbolized pollution, a disguised sexual complex.

The close resemblance of enuresis to the involuntary nocturnal escape of semen has also been pointed out by other writers. Henoch, for example, calls particular attention to the striking fact that both these conditions are in some way related to a filled bladder and to an existing hyperesthesia of the bladder neck or entire bladder mucosa, and that they usually occur in a dorsal posture of the patient and commonly are accompanied by dreams pertaining to micturition. Herman thinks that the analogy to nocturnal seminal emissions is obvious in that both conditions are spasmodic affections due to weakness of spinal nerve centres. Similar views are expressed by Janet and others.

It seems interesting to consider here with more detail the existing difference of opinion as to the relation of a dream and deep sleep to enuresis, a point already mentioned in the foregoing. Petit, as quoted by Mello-Leitao, distinguishes three kinds of patients: children too lazy to rise from bed; children who sleep so soundly that the warning from a distended bladder remains unheeded; and finally children who dream that they are passing water.

The frequency with which dreams accompany the expulsion is mentioned by Henoch. According to Morris, writing in Allbutt's "System of Gynecology," enuresis nocturna is of psychopathic (mental) origin. It arises from the child having a besetting dream of passing water, and this is aggravated by the fear that she will wet her bed. From thirty-six personal observations Perrin concludes that this condition is not due to any organic weakness of the sphincter, but in nine out of every ten cases is the result of deep sleep which leaves the bladder function entirely dependent upon the medullary centres. "A carbon-dioxide intoxication as the result of insufficient respiration, as in case of adenoids or polyps, may play a rôle in this connection."

A rather original explanation is offered by Wachenheim. He believes that enuresis is a developed habit. Like tics or habit spasms it is almost continuous. The bladder tends to empty itself whenever a small quantity of urine accumulates. The predominance of nocturnal incontinence is due to the absence of a distracting influence during sleep, for it is well known that a habit spasm is temporarily suspended when the patient's attention is directed thereto. In further support of his theory he points to the fact that enuresis is often found associated with other unquestionable habit spasms like stuttering. It also appears at the very age when such other spasms commonly manifest themselves. The lesser tendency of enuresis to continue into adult life he explains by the fact that the genito-urinary tract, which at the time of puberty undergoes such radical changes, is involved.

But as already mentioned Frankl-Hochwart repudiates the sleep theory as such, because, in his belief, under such conditions enuresis

nocturna would be a very common disease. He refers to the views of some writers who consider the accompanying dream of micturition not the cause but actually the secondary result of the beginning escape of urine or the resulting sensation of wetness, and he seems to accept this view as correct.

In spite of this general tendency to regard enuresis only as a symptoms due to a great variety of causes, we still meet with papers which attempt to prove the special etiological importance of one particular condition.

According to McGirk a phimosis produced by an adherent prepuce of the clitoris is a common cause of enuresis. In 9 cases he either freed or removed the prepuce, and in this manner cured a long and persistent nocturnal incontinence. In two of these instances he found the same condition in mother and child.

Hart and Barbour emphasize the relative frequency of ascarides. They refer to the observations of Goltz, who found that, where section of the spinal cord in the dog above the lumbar segment had produced retention of urine, he could make the animal urinate by sponging the anus with cold water; a reflex impulse passed from the rectum, lessening the activity of the inhibitory centre and allowing bladder contraction. In a child, ascarides in the rectum will act in the same manner when it is asleep.

Threadworms, in the belief of Still, are so often the cause of enuresis that it is wise, even when their presence is denied, to give one dose of santonin with calomel to make this point certain.

Obviously, in this maze of theories the internal secretions are not missing. Zanoni, as quoted by Mello-Leitao, considers enuresis a functional disorder of the suprarenal glands. Mello-Leitao himself believes that at least in some instances this incontinence is due to an alteration of a certain hormone of the internal secretion of the kidney, which thus becomes unable to act on the bladder sphincter. Williams, in several papers, defends his theory of a thyroid insufficiency as a very important cause of enuresis.

Like many of the other theories these last mentioned are almost entirely based upon therapeutic results. The weakness of any conclusion concerning the etiology of a disease drawn from the curative effect of any special form of treatment is obvious, but especially so in a disease of the type of enuresis, in which the psychic and nervous element undeniably plays an important rôle, and in whose treatment, therefore, the simplest suggestive effect of any drug, manipulation, or operation probably represents the deciding factor in the result obtained.

The good results obtained with epidural injections, to be considered later in detail, have led to a study of the lower end of the spinal column and to a new theory of the cause of enuresis. Fuchs and Mattauscheck were the first to assert that this incontinence is due to a deformity of the sacral hiatus, resulting in an occult spina bifida, or, to use the term usually applied by the contributors to this

particular question, representing a myelodysplasia. Peritz examined, by means of Roentgen rays, 20 guardsmen, 2 other adults and 20 children, all suffering from enuresis. He found a pronounced myelodysplasia in 68.2 per cent. of the adults, and in 25 per cent. of the children. Instead of the normal small triangle of the sacral hiatus one sees in these cases a wide opening, extending high up, with or without cross-bars. Trembur discussing these findings acknowledges that Trømmer (*Muench. med. Wochenschr.*, p. 1465, 1912) apparently has good reasons to repudiate this theory, but finds himself forced to accept the possibility of an etiological relation between this myelodysplasia and enuresis. In the *x*-ray pictures of 13 soldiers suffering from an enuresis, he found the hiatus of the sacral canal perfectly normal only in two, and even in one of these there was a slight deviation. In a control examination of healthy individuals he found the hiatus normally shaped in every instance.

This consideration of the etiology of enuresis can very appropriately be closed with an interesting table presented by Ruhräh, in which he tried to group logically at least all the most important causes as suggested by the various writers.

(a) *Physiological Causes*.—Taking of too much fluids.

(b) *Eliminative*.—Faulty metabolism; eating too much salt; due to drugs.

(c) *Urine*.—Hyperacidity, alkalinity, bacteriuria.

(d) *Genito-urinary Organs*.—Inflammations (urethritis, cystitis, pyelitis); calculi; polyps or tumors; hypertrophy.

(e) *Nervous System*.—Hypertonia or irritability of bladder; weakness of sphincter; reflexes (balanitis, vulvovaginitis, anal fissure, rectal polyps, intestinal parasites); malformation of spinal cord; general debility.

(f) Diabetes mellitus or insipidus; rachitis; thyroid insufficiency; enlarged adenoids or tonsils.

The list is not complete, but probably long enough to prove the fact, well known to the practitioner, that while theoretically the appropriate treatment undeniably depends on the recognition of the underlying cause, in many instances it will be difficult, if not impossible, to determine it or to select one among the many possible ones presenting themselves in the same case.

In the various suggestions of the writers as to how the responsible cause is to be found, the lack of a definite meaning of the term enuresis again becomes very confusing.

Frankl-Hochwart, using the term in its very limited application only to idiopathic cases, insists that, before the diagnosis can be made, all local diseases in the urethra, bladder, kidney, vagina, etc., must be excluded. He emphasizes that vertebral caries may lead to bladder symptoms, that in 50 per cent. of the cases of progressive paralysis in children disturbances of micturition will occur, just as they are common in chorea. Other spinal cord conditions, such as

spina bifida, multiple sclerosis, and, in rarer instances, also poliomyelitis may cause incontinence. Anomalies in the central nervous system, idiocy, cretinism, etc., are often associated with bedwetting. Epilepsy, diabetes mellitus or insipidus should be excluded. In cases in which there never was a period of continence, the enuresis may be due to a congenital aplasia either in the spinal, ganglionic or muscular apparatus. Frankl-Hochwart and Zuckerkandl explicitly state that in the older writings the presence of helminths, of eczematous, inflammatory conditions or of anatomical anomalies of the external genitalia was often emphasized as an important etiological factor, and that in their own experience, however, such findings are rather rare and can be considered only as accidental complications. Obviously these writers lay particular stress on the frequency with which signs of neuropathic conditions can be found in these patients, and advise that no mistake should be made in misinterpreting apparent nervousness which is only caused by shame or fear of punishment. Inquiry into past history will often reveal convulsions in early childhood, pavor nocturnus, signs of imbecility, etc. These children often are masturbators and exhibit typical symptoms of neurasthenia and hysteria. In old neuropathics a history of enuresis in childhood is not rare. In the ascendancy of such incontinent children instances of very serious neuropathic conditions will often be found, and not rarely several cases of nocturnal incontinence are observed in the same family. They quote the case of Munro: The father had an enuresis until late in life, his six living children (five girls and one boy) all suffering from diurnal and nocturnal incontinence.

In their experience a urological examination usually gives a negative result. A reduced sensibility of sphincter to the faradic current has been described, also a deficient reaction of detrusor to filled bladder. In their belief, as already quoted, the etiological factor in true cases of enuresis is found in a reduced tonicity of the bladder sphincter.

Burkhardt and Polano with similar emphasis state that a careful examination always reveals an abnormal weakness of the sphincter muscle which in boys is often associated with an underdeveloped prostate gland.

Using the term enuresis in a very broad sense, Henoeh claims, on the other hand, that it seems unjustifiable to assume a sphincter atony in an otherwise healthy child. A reflex irritation of the detrusor to him seems a much more plausible explanation, and, therefore, the main point in the diagnosis is to find the source of irritation; very discouraged, however, this writer adds, "but in the majority of cases this is impossible."

Rey carefully studying 52 cases comes to the conclusion that it seems quite superfluous to explain the phenomenon of bedwetting on the basis of a hysteria or neurasthenia, because a chemical and microscopical investigation of the urine will indicate almost in every

case some definite lesion in the urinary tract responsible for the anomaly.

Simpson, holding identical views, actually classifies the indicated methods of treatment according to the urinary findings. Mention has been made of the importance of an x-ray examination of the sacral opening in revealing a myelodysplasia. Trembur, who is the latest author who wrote on this anomaly, mentions another interesting finding, in his opinion very important in the diagnosis of enuresis—namely, a trabeculated condition of the bladder-wall readily seen with the cystoscope.

The one final conclusion to be drawn from the foregoing would seem that the practitioner should not accept in good faith the diagnosis, usually made for him by the child's mother, and after a superficial examination proceed with his customary routine treatment. The intelligent management of the individual case undeniably requires a careful study of the history, including a search for nervous troubles in the ascendancy and a most painstaking physical examination. In many instances a neurological and urological examination, including cystoscopy, is advisable. In rarer instances only the x-ray picture may reveal a myelodysplasia, and then justify the treatment by means of epidural injections.

In taking up, as the last part of this review, a consideration of the literature dealing with the therapy of enuresis, we can easily dispose of the contributions of those writers who believe in one definite etiological factor. Zanoni emphasizes the efficacy of adrenalin, Williams of thyroid extract, and Mello-Leitao advises the administration of fresh kidney substance from sheep.

Ruhräh also obtained remarkable results with thyroid extract, especially in those patients who exhibited other symptoms that might be attributed to thyroid insufficiency. He states that the effect in these cases will be obtained very promptly or not at all. This experience corroborates the statements of Firth. He treated 28 consecutive and unselected cases of enuresis with thyroid extract. As far as possible, in these patients absolutely no change was made in their usual mode of living. Adenoids were not removed, nor anthelmintics given even in the presence of threadworms. Of these 28 cases, 16 showed marked improvement or were cured, while 12 were not benefited. He obtained the best results in backward patients in whom the enuresis had persisted since childhood.

The one logical treatment directed against the assumed weakness of the sphincter has been suggested by Sænger, and is described only in Hofmeier's textbook. It is a urethral massage effected by the introduction into the urethra of a short metal catheter. Short, jerky motions are made against the sphincter in all directions, passing around the circumference of the urethra. In the experience of the reviewer satisfactory results are obtained with the Sænger method, which would seem to deserve more attention. Many writers advise direct massage of the sphincter with the finger introduced

into the rectum. Thus Zangger recently reported good results from a massage of the neck of the bladder twice a week for four to five minutes, according to the Walko method, also from squeezing this muscle as recommended by Thure Brandt. Others attempt to increase the sensitiveness of this region by galvanisation or application of silver nitrate solution. Such methods are not only painful, and possibly cruel; but as all manipulations with the genitalia are hardly advisable for a child, Kapsamer, Klotz and others actually warn against them.

Taylor attempts to stretch the detrusor and at the same time to strengthen the sphincter by instructing these patients to retain the urine in the daytime as long as possible. Wachenheim, on the other hand, is certain that the logical treatment of enuresis lies in the development of a fixed habit of emptying the bladder very regularly at definite intervals, since "the most rational and most successful treatment of all tics consists in making the patient perform voluntarily the very movement which he is performing subconsciously."

There is practically no difference of opinion manifest among the writers as to the advantage of reducing the amount of fluids taken in the late afternoon, of emptying the bladder before going to bed, and awakening the patients occasionally during the night. Indeed, for this latter purpose some ingenious automatic devices have been described.

Genouville's apparatus (mentioned by Mello-Leitao) consists of two metal plates separated by a piece of absorbent cotton. These plates are connected by wires to the poles of a battery and to an electric bell. They are placed beneath the child's pelvis. When the child urinates the wet cotton completes the circuit, the bell rings and awakens the child. Very good results are claimed for this device. Klotz refers to a very similar arrangement described by Pfaundler.

To avoid undue pressure against the neck of the bladder it is recommended very generally to elevate the foot of the bed and to prevent the child from sleeping in the dorsal position by placing a pillow under one side.

By most writers, the physician and especially parents are warned against using threats or actual punishment; in the latter case, of course, an exception should be made in the case of the child who actually wets the bed solely because it is too lazy to get up.

In the opinion of some authors the sacral centres can be influenced by local hydrotherapeutic measures and the application of electric current to this region. While some authors in this manner only expect to reduce the increased irritability of this centre, others actually claim to influence either sphincter or detrusor action, in accord with their own pet theory, by strengthening the one and weakening the other. Thus it is claimed by Vietinghoff-Scheel that a vibratory massage of the back in the lumbar and sacral region, after the Zander method, leads to a strengthening of the musculature of the bladder through the resulting irritation of the four upper

sacral nerves. And he himself quotes Kobert, who, in his textbook of pharmacotherapy, claims that the medicinal treatment of enuresis calls for a differentiation between those cases in which antipyrin, atropine, bromides, etc., are used to reduce hyperactivity of the detrusor and the other group, in which strychnine or ergot will increase sphincter atony.

With the exception of Klotz, who advocates a strictly vegetarian diet, no other new suggestions can be found in recent literature concerning the purely dietetic management of these patients.

The one drug most universally recommended and generally used is belladonna. Recent writers emphasize that failures with this drug are almost always solely due to the fact that the medication is discontinued too early if results do not become manifest. Atropine, used either in the form of the extract or tincture, gave Thursfield satisfactory results, but it must be used for a long time, from three to six months being required on an average for a complete cure. In Simpson's experience the only effective drugs are belladonna, calcium citrate and urotropin, but only if given systematically and persistently for a period of from three to six months. The treatment, in his belief, is dependent upon the urinary findings, and he, therefore, divides the cases into four groups:—

(a) Urine does not contain abnormal elements. Treatment: Tonics, improvement of general condition, later belladonna, beginning with small dosage, which is gradually increased, avoiding toxic symptoms. This medication to be continued for a long time.

(b) Urine very acid, rich in urates, of high specific gravity. Diuresis below normal. Treatment: Calcium citrate to reduce acidity, later belladonna. Strychnine if general condition is unsatisfactory. No meat in diet.

(c) Urine neutral or alkaline, of low specific gravity, containing triple phosphates, at times traces of albumin or pus. Treatment: No carbohydrates. If urine very alkaline, sodium phosphate. Later belladonna.

(d) Urine contains bacteria. Treatment: In coli bacillus infection, urotropin; in mixed infection salol, possibly vaccine therapy.

In his personal experience all other methods of treatment such as hypnosis, hydrotherapy, epidural injections, etc., have proved less satisfactory than belladonna.

We must consider finally the value of epidural injections recently recommended for very stubborn cases which remain unrelieved by all the other more simple methods of treatment.

These injections were first described by Cathélin to replace the more dangerous lumbar anesthesia. Their effect upon enuresis was a later observation, first recorded by Albarran and Cathélin. Soon followed other favorable reports, especially from French physicians, and in 1904 Cathélin claimed 75 per cent. cures in a total of 2,000 cases. A very complete review of the literature pertaining to epidural injections can be found in the recent paper of Sieber. He

enumerates the very many advocates of this method, but also mentions as opponents Gœtzl and von Eiselsberg. A very clear and well-illustrated description of the technique of these injections can be found in a paper by Stœckel.

Opinions are divided as to the advantage of injecting a weak cocaine or a normal salt solution. Cathélin himself used both without noticing a distinct difference in the results. Those who prefer the cocaine employ it in a strength varying between 1/10 and 1 per cent., according to the quantity which is introduced. Albarran and Cathélin at first injected 1 c.cm. of a 2 per cent. solution, but in general a larger quantity of a weaker solution seems to be preferable, novocaine now usually taking the place of cocaine. The total quantity used by the various authors, both of cocaine or saline solution, varies between 10 and 40 c.cm. In many instances these injections have to be repeated on an average every four to five days, Forbat, for example, giving the same patient from twenty-five to thirty injections before he obtained a permanent cure. Sieber himself employed the method in 10 cases with 3 cures, 2 improvements, 3 temporary improvements and 2 failures. He states, however, the important fact that for external reasons 7 of these patients received but one injection. He tested both solutions without noticing a marked difference in effect. Kapsamer records 25 cures in 37 patients, obtaining a favorable effect in 8 cases after the first injection.

The method has apparently been tested very extensively, and so far no serious sequel to these injections has been recorded. In view of this apparent lack of danger and of the satisfactory results, most recent writers recommend the use of epidural injections for all cases which do not respond to the simple modes of treatment. As already stated, the therapeutic value of the method was discovered and ascertained empirically, and we do not possess to-day a really acceptable explanation of the manner in which the injection of a fluid into the epidural space might beneficially influence the existing derangement of physiological bladder function. Cathélin himself thought of a simple mechanical effect on nerve roots or cauda equina respectively, and speaks of a 'vertebral traumatism' resulting from the injection. This explanation would seem acceptable if the favorable effect would be dependent upon the introduction of a large quantity of fluid. The efficacy even of very small injections, however, certainly speaks more in favor of a chemotactic effect on the nerve elements, though such an explanation is not in accord with the fact that these elements are surrounded by the dura which notoriously is not easily permeable by fluids. While Cathélin assumes that this 'traumatic' effect is transmitted to the spinal centres, Jaboulay suggests a transmission to the hypogastric plexus, and Kapsamer directly to the sphincter and detrusor muscles, increasing the tonus of the former and relaxing the latter. Cantas, who cured 13 and improved 2 patients of a total of 15, feels that the effect must be mechanical on the sacral plexus and sympathetic fibres

which are stretched. This view is based on his observation that the effect increases proportionately with the quantity of fluid injected, a claim certainly not borne out by experience in labor cases, in which epidural injections have been tested on a very large scale. Sieber himself comes to the conclusion that epidural injections exert their beneficial effect by an indirect reduction of the tonus of the sympathetic system, his theory being, as already mentioned, that enuresis is due to a hypertonicity of this system. Peritz offers an explanation based on the myelodysplasia theory which is supported by him. The effect is mechanical. The injected fluid distends the cicatricial tissue and cross-bars, associating the defective development of the lower end of the spinal column. The nerves thus are freed from the pressure exerted by constricting bands and resume normal function.

Instead of the technically somewhat difficult epidural injection, Jaboulay advocates a retrorectal subcutaneous infiltration of the perineum between the scrotum and anus (he is a military physician) by means of a quick and forced injection of from 50 to 60 c.cm. of saline solution. He obtained good results with this method in soldiers. The procedure obviously is a very painful one, and this leads to the question raised by so many writers and already alluded to, as to how much of the result of any given method is actually due alone to its suggestive effect. Indeed, among others we find Allaria recording his perfect results with the Cathélin method in 22 cases, employing saline solution, and then stating in conclusion that after all the good result probably is merely the effect of suggestion. This very same confession is made by Mello-Leitao, who cured 5 out of 7 very obstinate cases with epidural injections. Obviously the suggestive effect of a method will be almost proportionate to the amount of pain, and, therefore, Cahier's method, based on no anatomical or neurological explanations, is yielding splendid results. Sisto quotes an interesting case described by Zubizarreta: He made an epidural injection into a child in the children's ward. The child screamed very loud and all the other children suffering from enuresis in this same ward remained continent for the next few nights.

The possible suggestive effect of such procedures as the electric bell, etc., seems obvious and a suggestive effect by no means is limited to the neurotic or hysteric patient. A critical study of the literature on enuresis, as presented in the foregoing, therefore seems to lend support to the rather pessimistic statement made by Klotz: "All the drugs and methods which have been recommended may be employed. It is not so important what is done, as how it is done and who is doing it."

WHOOPIING-COUGH: ETIOLOGY, DIAGNOSIS AND VACCINE THERAPY.

A REVIEW OF RECENT LITERATURE.

By ALFRED FRIEDLANDER, M. D., of the Editorial Staff.

1. Inaba: The Bordet-Gengou Bacillus of Whooping-Cough. (*Zeitschr. fuer Kinderheilk.*, Vol. 4.)
2. Mallory and Horner: The Histological Lesions of Pertussis. (*Journ. Med. Research*, November, 1912.)
3. Mallory (*Journ. Med. Research*, March, 1913).
4. Dobeli: Etiology of Pertussis. (*Correspondenz-Bl. fuer Schweiz. Aerzte*, No. IV, 1912.)
5. Feer (*Correspondenz-Bl. fuer Schweiz. Aerzte*, No. 6, 1912).
6. Morse: Whooping-Cough. (*Pediatrics*, June, 1913.)
7. Delcourt: Diagnosis of Atypical Pertussis. (*Pathol. Infant*, Vol. 9, No. 1.)
8. Nicolle and Conor: Vaccine Treatment of Pertussis (*Journ. Amer. Med. Assoc.*, p. 209, July 19th, 1913.)
9. Klimenko: Vaccine Treatment of Pertussis. (*Arch. des Sciences biol.*, St. Petersburg, Vol. 17, No. 2.)
10. Scott (*New York Med. Journ.*, No. 1, p. 176, 1913).
11. Bamberger (*Amer. Journ. Dis. Children*, January, 1913).
12. Zahorsky (*Interstate Med. Journ.*, Vol. 19, 1912).
13. Sill (*Amer. Journ. Dis. Children*, May, 1913).

In 81 cases examined Inaba found the Bordet-Gengou bacillus seventy-eight times. In 88 per cent. of these cases, the bacillus was grown in pure culture. In 18 cases of disease of the upper respiratory tract clinically *not* pertussis, the bacillus was never found. It was possible to inoculate apes with the bacillus and produce typical cases of pertussis.

Mallory and Horner find that pertussis is due to a minute bacillus (corresponding in every particular to the Bordet-Gengou bacillus) which occurs in large numbers between the cilia of the epithelial cells lining the trachea and bronchi. The location of the bacillus is characteristic for the disease. Its action seems to be largely mechanical. The reason that the Bordet-Gengou bacillus has not up to the present time been unqualifiedly accepted as the causative agent is because its presence has hitherto not been associated with any definite histological lesion. It might thus have been a secondary invader, like the streptococcus in scarlet fever. But the work of these authors shows that there is a constant definite lesion—that these bacilli probably mechanically interfere with the action of the cilia in the trachea and bronchi. In addition to the demonstration of the primary essential lesion, Mallory and Horner have

succeeded in producing whooping-cough in young animals four times—each time obtaining the bacillus in pure culture from the inoculated animals. These animals all showed the characteristic lesions also. The authors explain the diminution in numbers and final disappearance of the bacillus in the course of a few weeks—in typical cases by the suggestion that conditions for growth become unfavorable, probably owing to the development of some antibody. They feel that their results should encourage further search for a vaccine or antitoxin which may be therapeutically efficacious.

Dobeli sets up the remarkable hypothesis that pertussis is not a pure clinical entity. It is merely a symptom-complex, occurring in neuropathic individuals afflicted with catarrhal conditions of the upper respiratory tract. In order to get typical attacks a child must have heard, possibly even seen, attacks. The infection is thus purely psychic.

Feer, in answer, adduces testimony of undoubted value to prove the absurdity of such a hypothesis. The frequent cases of pertussis in nursing infants who could not acquire infection through psychic means alone would be enough to disprove Dobeli's theory. This theory has also been advanced by Czerny.

It is probably true that neuropathic children have more severe cases, *ceteris paribus*, than normal children. Feer rightly calls attention to the danger to the community lying in the acceptance of such theories as Dobeli's. Morse calls attention to the seriousness of whooping-cough as a factor in child mortality. In 1910, according to United States Public Health Reports, the death-rates per 100,000 were as follow: Whooping-cough 11.4 per cent., scarlet fever 11.6 per cent., measles 12.3 per cent., diphtheria 3.4 per cent.

The diagnosis of whooping-cough, especially in its earlier stages, thus becomes a matter of great practical importance. The isolation and recognition of the organism by culture is too complicated for practical everyday use. An agglutination reaction is present in many cases. Its presence is proof of the existence of pertussis; its absence does not negate the diagnosis. The complement fixation test should be of great value in the recognition of abortive and atypical cases, and thus of great epidemiological importance. Lymphocytosis is fairly constant, and is thus also a diagnostic point. (Unfortunately, in young children, lymphocytosis is of little diagnostic value, because of its occurrence in a great variety of conditions, even in normal life.)

During a severe epidemic of pertussis, Delcourt found the complement fixation test of the greatest possible value, especially in the recognition of abortive and atypical cases.

The literature of late, as usual, has been filled with suggestions as to the therapy of pertussis. It is noteworthy that quinine seems to retain its place, and its value is attested by many observers. Just at present, however, special interest attaches to the question of vaccine or serum therapy.

Nicolle and Conor made vaccine from pure cultures of the Bordet-

Gengou bacillus, put up (after proper treatment) in emulsion of physiological salt solution. Each drop represented about 400,000, 000 bacteria, and in treatment from 1-5 drops were given (being further diluted in salt solution). Of 104 cases treated, 37 (35 per cent.) were cured very rapidly, 40 (38 per cent.) greatly improved and 27 (26 per cent.) not affected. In the case of cure, the improvement occurred very rapidly, usually after the second inoculation. Injections were given subcutaneously into the thigh. Klimenko reports very good results in a series of 35 cases. In the majority of cases the serum seemed to have a beneficent effect in reducing the number and severity of the paroxysms, and in the improvement of pulmonary complications when they existed. Scott treated 17 cases aged from five months to eight years, who were for the most part poor, ill-nourished and badly developed. He first gave doses of 10,000,000 to infants and 20,000,000 to children—twice a week. Later this dose was increased four times. No bad results occurred. All were cured except three and they showed distinct improvement.

Bamberger reports 6 cases, using 20,000,000 bacteria every other day. The treatment seemed rather to lessen the severity of the attacks and abort complications, rather than to shorten the duration markedly, although only 2 of the cases lasted as long as six weeks. The author feels that the sooner treatment is begun the better the results, and suggests that much larger doses might be used, apparently without harm and probably with benefit. (It will be remembered that Zahorsky has also advocated larger doses.)

Sill reports 33 cases treated by the vaccine. Absolutely no untoward effects were noted in any cases. In all cases, the number and severity of the attacks were lessened, though apparently in many instances the duration of the disease was not shortened. The average length of time of cough after beginning the treatment was four and a half weeks. In regard to the amount given, the author was guided more by the severity of the case than by the age of the child. Most of the children were from six months to three years of age. As a rule, the children did better when given moderately large doses every other day. The author advises average doses of 50,000,000 bacteria.

An interesting observation of this author was with reference to the prophylactic use of the vaccine. Immunizing doses of the vaccine were given to children in a family in which one of the children was under treatment for pertussis. One child of five was given four injections of 20,000,000 each, over a period of one month. Another child, three years old, got nine injections of 20,000,000 each, over a period of a month. These children had never had pertussis and were constantly exposed. Neither child contracted the disease, and it would thus seem that the vaccine may confer immunity.

DIAGNOSTIC AND THERAPEUTIC NOTES.

THE NON-SURGICAL TREATMENT OF HOT ABSCESS.—Cocco (*Wien. méd. Wochenschr.*, p. 2231, 1913). Certain body fluids have a marked anti-fermentative power. Among these, the most readily obtained are the fluids of ascites, hydrocele and pleural transudate. These fluids if injected into a pus cavity will always, in the writer's experience, lead to prompt recovery. The cosmetic result is far superior to that following incision. His technique is as follows:—

1. The pus is aspirated by means of a syringe.
 2. Through the same needle, the pus cavity is washed out with the ascitic or other similar fluid.
 3. The cavity is filled with the fluid and the needle withdrawn.
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COMMON SALT IN HEMOPTYSIS.—Mueller (*Brauer's Beitr. zur Klin. der Tuberk.*, Bd. 28, 1913). Mueller treats hemoptysis by means of intravenous injections of hypertonic salt solutions. At first from 1 to 4 injections of a 10 per cent. solution of sodium chloride are given, 5 c.cm. being injected each time. If this does no lead to a cessation of the hemorrhage, 5 c.cm. of a 15 per cent. solution are used. The injections were given two or even three times daily. No ill effects were ever observed.

In 35 of the 50 cases so treated, the hemorrhage ceased at once. In 21 of these cases, the effect was permanent; in 14 cases, relapses occurred. In 5 of the 50 cases, no effect was observed. Moderate hemorrhages, especially in cases of fibroid phthisis, yielded much more readily to the treatment than larger ones and those from ulcerating lesions.

INDICATIONS FOR GASTRIC LAVAGE.—Boas (*Deutsch. med. Wochenschr.*, No. 44, 1913). At present, many physicians use gastric lavage in cases in which it cannot possibly be of service. Among these may be mentioned gastric atony, mucous gastritis, gastric neurosis, and even other affections such as diabetes. According to Boas, repeated lavage is useful only in cases in which abnormal stomach contents cannot be evacuated through the pylorus, and even then only if the obstruction cannot be influenced dietetically. It is thus not a dominant feature in the treatment of gastric disease but only a temporary refuge which should as soon as possible be replaced by other methods, surgical or dietetic. In many

cases, lavage can be replaced with benefit, by simple expression of the stomach contents.

The addition of antiseptics to the wash water is rarely worth while. Laxatives are most frequently useful, but even these can usually be given just as well without the use of the tube. In gastric fermentation or intestinal putrification, Boas likes to give magnesium salicylate in doses up to one teaspoonful three times daily. It acts at once as a laxative and as an intestinal antiseptic.

THYMUS IN GRAVES' DISEASE.—Rahel Hirsch (*Deutsch. med. Wochenschr.*, No. 44, 1913). Children bear thyroid preparations much better than adults and rarely acquire Graves' disease. The reason may be that their active thymus is able to neutralize the excessive or morbid activity of the thyroid gland. This observation led the writer to try thymus extract in cases of exophthalmic goitre. She used Thymin-Poehl in tablets of 0.5 grm. each, but doubtless any good thymus preparation would serve as well. A typical case of the disease gained 30 lb. in two months and improved so markedly that a contemplated operation was no longer indicated. A number of patients, in whom an operation had led to no improvement, lost all of their symptoms as a result of the thymus therapy. In view of the harmlessness of the treatment, it seems to deserve a trial.

MEDICATED GREEN SOAP IN PULMONARY TUBERCULOSIS.—Stepp (*Fortschr. der Med.*, No. 31, 1913). Remarkable results are reported from the use of the following ointment in tuberculosis:—

R	Menthol.	10.0
	Thymol.	2.0
	Sap. kalin.	30.0
	M. f. ungt.	

A teaspoonful of the salve is rubbed into the skin once daily, either half of the back being used the first two days, the chest on the third day and either thigh on the fourth and fifth days. The ointment is allowed to remain *in situ* for twenty-four hours, is then washed off with warm water, the skin dried and anointed with oil. After two or three days' pause, the treatment is repeated. It must be continued for two or three months, though a beneficial effect is often observed during the second week. Even large lesions are said to clear up and to be replaced by scar-tissue. In children and young people the results are especially good and bone tuberculosis is said to be favorably influenced. The treatment is ineffective in acute tuberculosis, in acute pneumonic phthisis and in the tuberculosis accompanying diabetes.

A certain amount of scepticism will obviously not be out of place until the writer's enthusiastic statements have been confirmed by others.

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EDITORIAL.

ON THE ADVANTAGES AND DISADVANTAGES OF BEING A VEGETARIAN.

If there is one subject in medical literature that has a freshness that appears to be undying it is that very important one as to the amount of protein we ought to consume so that the number of diseases may be reduced and a peaceful and an eminently active working population evolved. It would seem that, although such authorities as Voit and Chittenden warned us against the eating of too much meat and showed beyond a doubt that a comfortable existence could be instituted by refraining from over-indulgence in this food commodity, their weighty words are already losing their value and are even being refuted by the newer investigators. And further, if we are to believe the latest expositor* on this very important subject, both Voit and Chittenden were altogether too generous in their allowance of protein, in fact were unscientific enough to seek favor with the meat-eating enthusiasts by meeting them half way in their demands. Thus we see that when a reform is instituted in a gracious manner and is made likable by a touch of sanity, it is not many months before discredit is cast upon it by another enthusiast who says it must stand battery or declare at once its inherent weaknesses. And to stand battery this message of Voit and Chittenden and others must face the exceptionally well-developed physique of Mr. Alfred Jörgensen, who "from January 18th to December 18th, 1912, lived on potatoes and margarine alone, except for a short period during the summer holidays," and who, "on December 20th, 1912, covered the distance, running and walking, between Haslev and Copenhagen—forty-two miles—in nine hours, notwithstanding that he had been out of training for the

*Protein and Nutrition. An Investigation. By Dr. M. Hindhede, Director of the Hindhede Laboratory for Nutrition Research, Established by the Danish Government. London: Ewart, Seymour and Co. 1913.

preceding five months at least, a feat that would have been an impossibility a year before, when even a short-distance run would bring on heart palpitation"; of Mr. Frederick Madsen, who after a strict potato diet, "took a place as farm laborer during harvest time, and after that as mason's laborer (August 9th-November 11th)"; of Mr. Esper Andersen, who "realized that he was eating too much—especially too much meat—and, therefore, cut down the quantity of his food, reducing his meat, in particular, to the minimum" and who "felt young again, cycling with greater ease than before, and conceived the idea of making a test of endurance under conditions similar to those governing his triumph of twenty years before"; and the author's daughter Karen, "my youngest daughter, who was born after my 'half-vegetarian period,' receives, according to old ideas, very poor and insufficient nourishment. She has never been urged to eat meat (many children, as is well known, have to be persuaded, or even forced to take meat), and is nearly always satisfied with gravy and potatoes." Thus Dr. M. Hindhede, of Copenhagen.

But even though the cases which have just been cited may enthrall the reader on account of a muscularity that the illustrations bring out in all those details dear to advocates of athleticism, let not his rejoicing be too great, for there is a reverse side to the picture that should stop all men, if only for a moment, in their triumphal march along the highway that gladdens the eye on account of a profusion of vegetables. For it has been written elsewhere that the innocence of vegetables, as a steady diet, is only superficial, and that when persisted in to the exclusion of meat certain undesirable complications set in. What these complications are need not be written in italicized letters, but they are important enough to point out to all those who may become so enamored of Dr. Hindhede's book, or of another recent publication on the same lines,* that no thought will be given them.

In an interesting article by Duroux** the matter of torsion of the large intestine and of the cecum is described in detail, and while he shows that in France, where the dietary is mixed, only 18 authentic cases have been reported, he quotes Leichtenstern, Philipowicz, and others as having stated that this rare form of volvulus is much more frequent among strict vegetarians such as the Norsemen and the Slavs; and although disagreeing with Hyrtl who said that in a cat fed only on vegetables for a year he found the intestine 3 in. longer than in a cat fed on meat, he is firmly convinced that among all people vegetable food of inferior quality that is badly cooked causes, beyond a doubt, dilatation of the bowel followed

*Some Tendencies of Modern Medicine from a Lay Point of View. By Right Hon. Sir Horace Plunkett, K. C. V. O., F. R. S. Dublin and Belfast: Eason and Son. 1913.

**Les torsions pathologiques du gros intestin et leur traitement chirurgical. I Volvulus du caecum. *Rev. de gynéc. et de chir. abd.*, October, 1912. Torsions du colon transverse et de l'S-iliaque. *Ibid.*, November, 1912.

by atony of the colon, which is certainly closely associated with volvulus. Now, not to discourage vegetarians too greatly we will practise candor and admit that the article from which we have just quoted is about the most severe stricture on the exclusive use of vegetables recently published in a medical journal; but, even though it is a solitary instance of the disadvantages accruing from a vegetarian diet, it suffices to show that the ardent vegetophiles, who are necessarily phobic when the smallest piece of meat floats within their ken, should make note of these slight occurrences when they place their alluring theories on pedestals of vast proportions.

But it is an altogether different matter when we combat the ideas of enthusiastic vegetarians, who in their writings assert that the dietary, if strictly followed, will result in the individual exhibiting no longer those blemishes of temper, those depressive moments which come to all who persist in being flesh fed. When we read the fascinating lines of these authors we are reminded of Dean Swift, morose and finally insane, although he ate apples to excess, at one time eating as many as 120 a day, and whose attitude toward Stella (Esther Johnson) and Vanessa (Esther Vanhomrigh) could not have been more despicable had he consumed 120 pounds of meat daily: of Henri Rochefort, recently dead, who was about the most irascible, irresponsible and erratic editor and publicist that France has ever produced, but whose friends and admirers thought him peaceful on account of his strictly vegetarian diet; of Bernard Shaw, that very tame animal in the literary arena, who has recently shocked the religious element of England by his play "Androcles and the Lion," and who, despite his excellent health which he has repeatedly attributed to the eating of vegetables, is about the most unmanageable literary character in England to-day with the exception of Chesterton, whom the vegetarians should claim even though he may not be a strict disciple of the cult at present, for his latest book, "The Flying Inn," is informed with such simplicity of thought and evenness of temper that by comparison the vitriolic writings of Rochefort are essays in one word expatiating on the beneficence of mankind!

There is no doubt that to-day, just as some decades back, there are some of us who eat too much and drink too much, and that not always do we know when to stop short opposite a savory roast that is garnished to whet our appetite, or to stay our hand when too many cups of a favorite brew have already passed our lips. And it can also be stated with certainty that the experiments on dogs in the laboratory, as to their possible subsistence on a low proteid diet, are interesting from a research standpoint and might be made applicable to man. But to asseverate that with the eating of vegetables halcyon days are instituted that wot not of fatigue, of ill temper, or of a single blemish on one's sunshiny disposition is carrying the subject into an idealized realm which exists only in

the imagination of the theorists. And we must not forget that Swift wrote to Stella from Windsor in July, 1711, to the effect that he had sent a haunch of venison to Mrs. Vanhomrigh and wished Stella had it instead. From which we must infer that though the Dean preferred apples to meat, he was not only lenient to his friends but most solicitous of their health and beauty, and did not want to see either one of his innamoratas reduced to his pitiable physical condition which he always attributed to the eating of apples. In fact, from a passage in his "Journal to Stella," in which he describes his daily struggle to eat fewer apples, we are inclined to think that the Dean occasionally got away from them, and really did not think it a fearful moral lapse to eat of flesh at Stella's house at Laracor, near Trim, or when dining with Vanessa and the other Vanhomrigh ladies. A poor example of vegetarianism to cite because of his drastic criticism of apples, and not a very moral man either, and hardly a gentleman, but a very good instance of what may happen to men of lesser ability if they become enmeshed in the wiles of siren fruit or vegetables.

P. S.

LITERARY NOTES.

Mr. Arnold Bennett can always be depended upon as a guide, for his manner of looking things square in the face, his perspicacity, his reverence of truth are qualities which everyone looks for but few find in a guide, be he of the nature of those pestiferous gentlemen who make European travel a bore by their ignorant audacities or a purely literary man who should know better. In his former book, "Your United States," Mr. Bennett was on excellent ground to write in his kindly critical and humorous way of a people whom he fleetingly met during his short stay among us, but in his latest excursion into the habits and customs of other people and other countries he is on much safer ground, for he has lived in France a goodly number of years, and being an Englishman who knows other Continental countries well is equally at home in Italy. And that this sort of cosmopolitanism is an asset, "Paris Nights and Other Impressions of Places and People" (George H. Doran Company, New York) attests in no mistakable manner, for the point of view is sane, the grasp of social peculiarities just, and the understandingness why people other than his own should follow a certain course in life of a high level. Paris has been interpreted badly and fairly well by various writers, it has suffered at the hands of those who write only of the café life as they see it from their coign of vantage in a fashionable resort, and it has been attacked and villified as no other city in the world. But in the hands of Mr. Bennett this much maligned place of pleasure, of poets and artists, of

scientists and earnest workers, becomes a something that we can read about again and again, for he has caught the spirit of the town and the reasons for its kaleidoscopic life. And of the same penetrative power and literary charm are the other sketches in this book—those pertaining to Florence, to the Riviera, and to various places in England. Still, despite our admiration of the author's skill in bringing before us by the bold dashes of his pen the numerous and important matters which generally escape the notice of the superficial traveler even when bent on reporting them for newspaper or magazine, the bright particular spot of this book has nothing to do with travel, but is so truthful a bit of characterization that not to give it the most prominent position in a criticism would be a grave error, indeed. Reference is here made to those delectable chapters describing "The British Home," in which the author is again the distinctive writer of middle-class life that he has shown himself to be in all his novels in which the Five Towns figure. Anyone wishing to see Mr. Bennett at his best should read this chronicle of the Smith family, for, be he rich or poor, the many bright remarks about what we conventionally accept as right will entertain him as few sketches of to-day are capable of. Altogether, this volume is one of charm and distinction, and what with a letter-press that is unusually good and a number of illustrations that are unique, the admirer of Mr. Bennett's art cannot go far amiss in acquiring this volume for his entertainment.

It is not so often that short stories by doctors are so exceptionally good that comment should not arise when a really excellent collection is laid before the reviewer for criticism—comment of a friendly nature tinged with considerable praise. This is our feeling opposite "The Indiscretions of Dr. Carstairs" by A. De O. (William Heinemann, London), for the stories are well conceived, the characters well drawn and the literary style of a high order. It might be objected by certain prudes that certain parts of these stories had best been left untold, but aside from this sort of criticism the stories invite only discriminating praise. Take, for instance, "Un Peu D'Amour" and read it carefully, and compare it with the best short stories you have read, even with your favorites, and what would be your opinion? Surely, if you approach it without any preconceptions, abandon yourself to its full enjoyment, can the impression that you gather therefrom be other than one of unalloyed pleasure? But to appreciate it to the full you must know what natural conversation is, you must know how men and women really act in certain circumstances, and above all you must be an admirer of the unities so sadly neglected by most writers of short stories. In "Adrift" we see the author in a new rôle and a really sympathetic one, though from our point of view not in his best.

The introduction of Gladstone into a flat of questionable repute is rather an unusual occurrence in a story, but the circumstances which led the statesman to visit it are quite natural indeed. And his leaving a copy of "Sister Dora on Nursing" the first time he called and "Uncle Tom's Cabin" the second was certainly a kindly act, but quite unworthy of the author of "Studies on Homer and the Homeric Age" and "The Vatican Decrees," though on second thought what books should have so distinguished a man brought to a Painted Lady? In "Death in a Chelsea Lodging" and "Heaven Well Lost" the author reaches a high mark in the art of story-telling, and shows what a master he is of pathos in the first, which is slightly reminiscent of Tolstoy's "Ivan Ilyitch," and how virile is the pen he wields in the second. In short, the reader who does more than skim over these pages will learn many a true lesson of life and be introduced to an author who is a craftsman of no mean attainments. We would place this volume on the same shelf with Conan Doyle's "Round the Red Lamp," or rather on a shelf a bit higher, for though our admiration of the Doyle book is great, it is still greater for the book under consideration.

It cannot be aught but condemnatory to make comparisons when reviewing a book, for it should stand on its merits and be judged by what it offers, irrespective of the qualities of a book on similar lines that has preceded it. But in the case of "The White Linen Nurse" by Eleanor Hallowell Abbott (The Century Company, New York) the reviewer pleads guilty to this defect in criticism, for to his mind a novel entitled "The Night Nurse" by the author of "The Surgeon's Log" is the standard of a story on the subject of resident physicians, nurses, and the high and low lights of hospital life. Still, even with this prejudice in the reviewer's mind, he would be more lenient toward "The White Linen Nurse" if it had other qualities to commend it besides a certain sprightliness that sounds forced at times, a fairly intelligent conception of real men and women, and a certain 'smartness' on the part of the author that too often partakes of a desire to let the reader know how quick and clever she is in drawing attention to defects of character and of face. But, be it said here, aside from what has been willingly granted this book in the matter of good points, it falls decidedly low as a literary production. In the first place, the language employed by the author is of so complicated a nature that he must be a wizard at unraveling to get at what she really means. Take this sentence which smites us in the face directly we open the book: "Like a strip of lip-colored lead suspended from her poor little nose by two tugging wire-gray wrinkles her persistently conscientious sick-room smile seemed to be whanging aimlessly against her front teeth. The sensation certainly was unpleasant." Of course,

one sentence, be it ever so remarkable, does not make a book, but as regards the novel under consideration there are many other sentences just as remarkable as the one cited. The heroine has a deal of attractiveness that no one in his right senses would gainsay, and her remarks are generally bright and to the point. But she is altogether too clever to be attractive through some 270 pages, since nothing is so boring as an uninterrupted flow of bright chatter; and as for the Senior Surgeon, he is just the sort of medical automaton that one always finds in novels but not in real life. (Here again we must except the hero of "The Night Nurse.") A joyous book is "The White Linen Nurse" but not a convincing one; and though the author is not without some talent, we cannot say that her performance is worth while, unless the reader wishes to spend a half hour in the hope of killing time that is hanging heavily on his hands.

It has often occurred to the writer of these lines whether it is possible for the untraveled American—untraveled outside his own country—to appreciate the humor of other people. If it is possible, and being a rare optimist the writer feels that this must be so, there are no better books before the public just at present to put the reader to the test in the matter of appreciating other humor besides that of his own country than the excellent novels of "G. A. Birmingham" (Canon Hannay). But if he does not want to read them all let him not neglect "The Adventures of Dr. Whitty" (George A. Doran Company, New York), one of the latest, for in this book he will be brought cheek-by-jowl with Irish humor in its best estate and also with a medical man who was human, all too human. What is Irish humor may well be asked here. If we understand it correctly it is the most human humor in the world, for it shows up the character of the Irish people in no acrimonious way but with a delicacy that can never be construed as insulting. Mixed with it is the whole scheme of an Irishman's life and philosophy, his point of view, his shrewdness, his carelessness, his lightness, and his optimism in the face of poverty. Now all these qualities which go to make up Irish humor "G. A. Birmingham" understands; and because he is so thorough a master of all its shadings his books stand out with considerable prominence from the rank and file of books which are littering our shelves to-day, and which are dull and uninteresting because of their pessimism and their utter lack of insight into the life of the 'common' people. Dr. Whitty is not cast in a heroic mould, for his foibles are many but his charms not fewer. He is racy of the soil of Ireland, and being Irish to the backbone let us make the best of him, and hold out hand to him, and praise him for his very human side and for having enough defects of character to make him superior to the automata usually met with in novels. No book that has come to the desk of the present re-

viewer in recent days has so favorably impressed him as has this tale by "G. A. Birmingham" that breathes the homely instinct of the Irish people, as well as their kindly philosophy and their irresistible humor.

In "An Irish Gentleman: George Henry Moore" by Colonel Maurice George Moore, C. B. (T. Werner Laurie, London) a portrait is given of the Irish gentleman as he was in the first half of the nineteenth century—a rollicking, harum-scarum, duelling person with a decided penchant for hunting and racing, a keen observer of people and customs during his travels, a parliamentarian of only mediocre attainments, a good linguist, a scholar of good parts, a landlord, and above all a fighter for his rights at any cost. He had all the animal spirits to which Charles Lever has accustomed us in his portraiture of Irish gentlemen and the faults of that somewhat feudal age of landlordism, though in this respect he was not so harsh towards tenants as were his neighbors, never having evicted one. But though he had the faults of the age in which he lived, his courage, his audacity, and on certain occasions his rashness are very taking indeed, for they declare the humanness of the man and, strange though it may seem, make him more likable than he would be without them. Of his parliamentary career we are not in a position to write with intelligence, not being familiar with the why and wherefore of the Tenants Right Bill or the Ecclesiastical Titles Bill; but no doubt to those who know the political history of that period in English politics the chapters devoted to the discussion of these Bills will prove of interest. But even though one may not be deeply interested in the wrangles which took place in the House of Commons, there is this to hold the reader's attention—the courage of a first-rate fighter even though defeat was at hand. In these colorless days of American politics it would not be amiss for aspirants to political honors to study a character such as the subject of this biography, if only to learn what a good asset indomitable will-power is, and how much better it is to be oneself with all one's faults than an automaton, whose spoken word is so circumspect that one suspects the tradesman who his fearful that the slightest act of discourtesy on his part will be construed as an insult to his customers and necessarily curtail his income.

If the reader should desire a decided change from the usual short story which our magazines publish from month to month and which moves on quietly and uneventfully from start to finish, let him turn to Mr. John Masefield's new book of short stories "A Mainsail Haul" (The Macmillan Company, New York) and learn what constitutes a highly seasoned sketch that has but little artistry in the telling, but

that has such candor and directness that he must perforce be won over. The great defect of the short story, as we are accustomed to it in our monthlies, is that though the plot is well conceived, so conventional are the writers that in the telling of it the same lines are followed lest the sensibilities of the reader be shocked. Now Mr. Masfield's mind being cast in a very original mould, it is impossible for him to follow a bell-wether, and this being the case the jaded reader will leave the repast he prepares with a whetted appetite. Not that these sketches of seamen and pirates show Mr. Masfield at his best—or rather at his poetical best—but what they do show is that he holds a virile pen and that even the slightest sketch that is most neglectful of plot has that something that stamps it with this distinguished author's unusual talent. Perhaps the reader, who is not the Masfieldian to the same degree as the writer of these lines, will be a bit disappointed on reading these stories and sketches; but let him not judge the author by this book alone, for he has written a number of others that have left their mark on the literature of the present day. But even granting that some disappointment may be the reader's return for a thorough reading of this book, he must—provided he knows something of the sea and the rough life of seamen—admit that no writer of the present day can paint the former in quite the same fascinating way or describe the life of the latter in quite the same masterly fashion.

A volume of essays with commendable qualities should not be passed over lightly, and in the book before us by Dr. G. Walter Steeves which he calls "Some Main Issues" (Chapman and Hall, London) we have what is commendable as regards optimism, a gentle philosophy and a pleasant literary style. While there is nothing out of the ordinary in this little book—nothing that would either excite us into a contradictory mood or exalt us into a state of enthusiasm—there are yet enough wise remarks on the topics of the day to prejudice us for it. Books of this sort will never set the Thames or even a smaller stream on fire, but they are needed just as much as any of those exasperatingly coruscating books which more distinguished essayists of these modern times are continually writing. And they are needed because they effect a ballast which the others never do; and who would be without ballast, whether natural, or acquired through the medium of books? Now when one writes of this book that its diction flows on easily, that its philosophy is the opposite of blatant, that the author's thoughts never stir us to indignation or to great enthusiasm, one is not condemning the book but rather praising it for intrinsic qualities which must appeal to the normal man. We take it the medical profession will never produce a Chesterton, a Shaw, or that wildest of all modern English essayists a Belloc; but even so our disappointment should

not be great, for to counterbalance this defect among medical men who write essays, we can say, with considerable pride, that in the ranks of the essayists writing to-day both in England and America there are a number of doctors who have the humor of Wendell Holmes and the placid philosophy of A. C. Benson. And of this sort is Dr. Steeves.

Those readers, who know only the psycho-pathological writings of August Strindberg and would not be averse from knowing a different phase of his literary career, should read "Historical Miniatures" (George Allen and Company, London). This book comprises a number of sketches of a historical nature that are so far removed from the hysteria which characterizes the Swedish writer's other books that the reader will have to rub his eyes more than once lest he might think that a certain dullness of vision is responsible for the deceit played upon him by the publisher. But these sketches are really and truly by Strindberg; and while it would be quite hazardous to advance the opinion that they are the best stories, or to give them their proper name, episodes, that he wrote, face to face with his high repute as the protagonist of the psycho-pathological novel, we are nevertheless strong in the opinion that here at least we have the well-poised mind of the author which we seek in vain in his other writings. A number of critics who read his works from "Miss Julia" to "Confession of a Fool" were inclined to think that despite his great talent as a writer he was given to pandering to lowly tastes that thrive in the morasses of immorality; but even with this thought in mind it could not be denied that his virility as a writer was unquestionable and that despite an exaggeration of the morbid there was yet to be read between the lines a mental grasp that included more important matters than the morbid. These higher intellectual flights are to be found in the present volume; and whether we read "Alcibiades" or "Peter the Hermit" the impression is one not easily forgotten, for imbedded in these sketches, not so deeply but that they may be readily grasped by the intelligent reader, are a number of the characteristics of the really great writer—not the puppet elevated to a pedestal of popular acclaim through the advertising methods of the prurient, but the artist in words whose intellect was a very precious gift indeed.

ORIGINAL ARTICLES.

BIOLOGY AND SOME OF ITS RELATIONS TO MEDICINE.

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Among the sciences taught in all colleges to-day, biology may well claim to be the youngest. Physics and chemistry certainly antedate biology by many years, while scholars had become famous in astronomy and geology long ere the name of biology was first coined. The men who attended a liberal arts college fifty years ago may have heard the term occasionally, but few had an opportunity to take any undergraduate courses in it. About twenty-five years ago the professors of botany and zoology began to offer courses in biology as an introduction to more advanced work in these well-established departments. It is easily within the memory of the writer when the medical colleges, even the very best, looked askance at a preparatory course in biology for future medical students. How great has been the change during the last few years! Biology is being required as a prerequisite to all of the best medical courses in this country. It may be time well spent if we enquire into some of the reasons for this revolutionary change in the past dozen years.

One gains some insight into the reasons for this change by simply noting that most of the new works on anatomy, physiology, pathology, etc., begin with an introductory chapter on biology. This chapter usually tries to present the general conditions in plants and animals as they are related to the theme in question. The service, then, which biology is rendering medicine is the working out of the fundamental relations of living things, which relations serve as the foundation for the study of man—the most intricate and highly differentiated of all animals. What are some of these conceptions?

With the appearance of Bergson's work "Creative Evolution" in 1911, a number of biologists attempted to define their conception of the relation between the living and the non-living. The result of the present discussion of this very old question is to leave one much in doubt as to what shall be regarded as a distinction. With the growth of our knowledge in science, we are more and more coming to realize that the explanation of any event, physical, chemical, or biological, consists in a statement of the conditions

under which it took place. Our added knowledge merely extends the description. Just what shall eventually be the explanation of the relation of the physico-chemical phenomena to living matter no one may safely prophesy. Time was when molecules and atoms were regarded as adequate to explain physical and chemical changes, but to-day with electrons as a further step in the analysis, one can but await the working out of their significance. A little reflection on these facts will serve to reveal some of the difficulties involved in attempting a specific statement of the ultimate distinction between the living and non-living. Whether vitalism or Driesch's entelechy, or the mechanical theory be our guide as we try to solve this problem, either will lead us to a consideration of several fundamental characteristics of the living which stand out in marked contrast to the non-living. These fundamental characteristics may be stated in the form of generalizations applying to all organic beings. The limitations of this article and the topics recently discussed in this JOURNAL place certain restrictions on the writer. Both the medical and lay press have made us acquainted with some of the striking relations of animals and plants to disease. Great and important as these are, we may pass them by at this time and confine ourselves to the biological relations involved in metabolism, the cell, reproduction, variation, and heredity.

Metabolism.—The term metabolism is familiar to students of biology, botany, zoology, bacteriology and medicine. In all these separate departments the word is used exactly in the same manner. It seems well established that each organic being stands in need of food. The reasons for this need are more evident in the case of animals than in plants, but the plant does work in growing branches and leaves, producing germinal elements, making food and carrying it to all parts in just the same sense that the animal works. As the organism replenishes itself, food is utilized. The three well-known kinds of food—namely, proteins, carbohydrates and fats, are universally found and pass through the same kind of digestive changes whether they occur in the leaf, the digestive tract of a vertebrate, or within the food vacuole of an ameba. We are daily putting together all that has been learned about each class of foods from all sources in our attempt better to understand just what happens in digestion. After the food has been digested, it must be carried to all parts of the body. Nature has devised a variety of mechanical contrivances to bring this about. We are all familiar with the heart and blood-vessels of vertebrates, but, as extensive as this system is, it is no more effective than the passive method employed by plants. As the absorbed food is brought in contact with the parts to be nourished, osmosis plays a large part. The method of osmosis seems to be the same in each instance—and yet are we certain that we can explain it? Are we to be satisfied with the physical explanation of a process which is universal in living things and at

the basis of all the finer exchanges that go on in the living body? Somewhere the writer has read that the more profound students of physiology have felt that the living cell plays a part,—contributes somewhat, to osmosis; and that the physical process is supplemented. This and many other suggestions merely serve to reveal that the problems of medicine are the common problems of all forms of living things when followed to their last analysis. As food is passed into the cells a series of upbuilding or constructive agencies in the form of internal enzymes, which serve to make the combinations of the nitrogenous and non-nitrogenous molecules more like those that exist in living substance, begin to act. Somewhere in here we all cease to explain. The biologist, the botanist and the physiologist have all walked hand in hand to this point, and when either one finds out some additional facts, then each will be able to use these and apply them to his specialty. There really is no specialty in the fundamental processes of an organic being. The specialty comes in applying what is known to the specialized group of plants or animals, or to man.

After a time these internal enzymes complete their work and the food becomes a part of the living body. How long the transformed food remains a part of the living body is a matter of conjecture. After a time waste products begin to appear, but the changes which initiate the formation of wastes is unknown, yet the process is continually going on. To cover these two widely different processes in an organism, the term metabolism is used. The writer is partial to the following definition by Chittenden: "Metabolism designates that complex of chemical changes in living organisms which constitute their life, the changes by which their food is assimilated and becomes a part of them, the changes which it undergoes while it shares their life, and finally those by which it is returned to the condition of inanimate matter. Gathered together under this one phrase are some of the most intricate and inaccessible of natural phenomena." In asking ourselves what are some of the distinguishing characteristics of an organism as contrasted with the inorganic, we may mention metabolism. In using the term in this way it is understood to include the changes indicated in the definition, and while these are many and divergent, yet they are a part of one vital process. Thus used, metabolism serves to mark off sharply the activities of living substances from all forms of activity in non-living matter, and is a distinguishing feature of living matter only.

The Cell.—In 1838 appeared the memorable contribution of Schleiden and Schwann, who declared as a result of their researches that every plant and animal was composed of cells. Many other investigators verified their conclusions until now their names are always associated with one of the few great generalizations in biology, the cell theory of Schleiden and Schwann. This doctrine

implies three propositions: (1) That all organisms can structurally be resolved into cell units, no matter how complex or how simple; (2) that every organism begins life as a single cell which by growth and differentiation gradually assumes the adult form; (3) that the function or work of all organisms can be interpreted in terms of the activity of its individual cells. "No other biological generalization save the theory of organic evolution has brought so many apparently diverse phenomena under a common point of view, or has accomplished more for the unification of knowledge." The names of many famous men are associated with the development of our information in cytology, and so great has been the progress of this line of study that only those who give all of their time to it realize its extent. For the last seventy-five years all students of living things have been able to speak the same language because of this universal similarity in biological make-up. What can the cell do? Under what conditions is its work best done? How does it grow? To what extent are plant and animal cells alike? These and many other questions lie at the basis of our attempt to understand the great problems of adaptation, disease, heredity, sex, evolution; in short, every biological question finds its best answer in a study of the cells involved.

One of the first facts that a student learns about cells is their wide range in size, although nearly all are microscopic. In shape the cell does not follow any definite form but is regulated by the forces that act directly upon it and by the nature of the cell, especially the cell wall. Not all cells possess a cell wall; the ameba is a naked cell, yet it does not mix with water and remains a distinct body that carries on all the necessary activities of an animal. It has always been difficult for the writer to cease observing an ameba crawling about in the water. Here one has two fluids, the inorganic water and the organic flowing protoplasm—so similar and yet so different. As one watches the protoplasm flowing, it seems as if the secret must be here somewhere hidden among the streaming granules. But we all have had to give up the problem, for as long as there is life in the ameba it retains its identity only to become indistinguishable in the water just as soon as it is crushed.

The two main parts of the cell, the cytoplasm and nucleus, have ever been and will continue to be studied with zeal. Cytoplasm presents a widely different appearance even in cells from a single animal; the distinction, however, is more evident when plant and animal are compared. The large range of passive bodies in the cytoplasm is responsible for this divergence. These passive bodies may be minute granules as in the starfish ova or large spherical masses as in the egg of a frog. In the green plant cells the cytoplasm is usually occupied by definite green masses known as chloroplasts. Starches and oils are often found stored up in plant cells in the cytoplasm, while in most nerve cells variously shaped

bodies occur which probably represent stored energy. In cases of prolonged starvation these bodies and large parts of the cytoplasm disappear from nerve cells, which would seem to indicate that these bodies are really some form of latent energy upon which the cell may draw in times of stress.

The nucleus of the cell is usually a more or less open meshwork except in the protozoa where the granules of chromatin are closely crowded. In the great majority of cells there is no difficulty in differentiating the nucleus by the use of suitable stains; in a few micro-organisms the chromatin granules are not collected into a distinct mass but scattered in the cytoplasm.

The non-dividing nucleus of most cells is divisible into the parts that take a basic stain and those that take the plasma stain. The basic structure is the chromatin network which may have various arrangements, but there are usually one or two deeply staining bodies, the nucleoli. The plasma stain reveals the presence of a number of minute granules in the nuclear sap as well as a framework for the support of the chromatin. The variety of appearances of the nucleus consists for the most part in the variation in the amount and arrangement of the chromatin.

Every cell has some work to do, and work requires energy. The principle of the utilization of energy in living cells has just been presented under the caption of metabolism. The added question at this point is, Are the conditions alike in plant and animal cells? As is well known the green plant cell has the power to manufacture food, and this process used to be confused with the nourishment of the plant. It is now maintained, and with good effect, that the source of all protoplasmic energy is in the food utilized and that the food of the plant cell is just as essentially organic as is that of an animal cell. The food of unicellular animals consists of small animals, small plants, and other organic particles that may be in the water; while the food of the microscopic green plant cells consists of carbohydrates, fats and proteins which have been manufactured within its own protoplasm. The chemical composition of the food then is the same in each instance although the form is distinct. The protein molecule made by plants is so complex that its form is made out with great difficulty as the following shows: The crystalline vitelline of the squash is written $C_{202}H_{481}N_{90}O_{88}S_{22}$, while the form of animal protein, hemoglobin, is supposed to be about $C_{712}H_{1130}N_{214}O_{245}FeS_2$. The problems of assimilation and dissimulation come down in their last analysis to the cell which acts as a physiological unit. The relations between the nucleus and cytoplasm are of a delicate nature but so intimate that the work of the cell is disturbed or inhibited if either is removed. The adage "we are as old as our cells" comes to have more significance when we realize their fundamental relations to all vital processes. When we are well, it is our cells that are well, and when we are sick, it is our

cells that are diseased. Finally, when that which makes the body living ceases to be a part of the organism, the cells are alive and gradually die first in this organ, then in that one, and the body is not really dead until the last cell has ceased to function.

Reproduction.—Until students of biology focused their attention upon the cell and worked out its general relations to vital processes, reproduction was but little understood. Here biologists have made their most brilliant contributions—results which have been applied directly to man. The more simple animals and plants often produce nearly transparent eggs which allow one to study the process in the living cells. It is impossible to separate growth from reproduction, because every cell which matures so as to be able to give rise to a new organism and then affords the basis for future development into an adult organism passes through a continuous series of growth changes. The term reproduction is often limited to the changes taking place in cells while they remain attached to the parent; but in the case of unicellular organisms there is usually no parent after reproduction but two new organisms which are orphans in the sense that they have no living parents except as these parents exist as a part of themselves.

Why should cells divide and thus utilize energy that might be directed into other vital processes? How has it come about that every physician is able to recognize the several tissues with their peculiar kinds of cells and feel perfectly confident in predicting the nature of the cells to be found in any normal human tissue tomorrow or next year? "The explanation of growth is one of the unsolved problems of biology, and we get but little nearer in the case of protozoan organisms than in the higher forms of life. We know, indeed, that growth ceases with the elimination of the nucleus; hence we conclude that the nucleus is a necessary factor in the process." The cell may divide in two ways, the more simple known as the direct and the more complex as the indirect. The more simple or amitotic is common in the lower animals and has been observed to be closely associated with reproduction in some animals. But as one passes to the higher animals the more complex or mitotic form of cell division comes to dominate. It is interesting to note that various forms of atypical mitosis and amitosis are common in diseased tissues. Something has upset the normal balance of the cell.

Early in the life of all embryos there are set apart cells which retain their simplicity of structure and can nearly always be recognized as germ cells. The rest of the cells in the body of the embryo gradually differentiate until the several organs can be determined. The germ cells do no work for their possessor and are often regarded as parasites to emphasize their lack of importance to the span of life of every plant and animal. This apparent isolation

of the germ cells has had an important bearing upon the various theories of inheritance.

It is well for us to have a clear conception of just what happens in fertilization. In animals and plants the simplicity of the process helps to eliminate much that has been read into the problem. The sexual instinct exists in some form or other in all animals; their chief energy is expended in producing sufficient germinal elements to insure the propagation of the species. After the germ cells have been set free many animals die—the purpose of the adult organism has been accomplished. Biology furnishes no justification to man for his indulgences and excesses. This is entirely a human problem and we gladly consign it to the medical fraternity. The two germ cells are wholly unlike in appearance, the round ovum contrasting strongly with the minute, conical, vibratile sperm; yet we are able to unravel the intricacies of spermatogenesis until the typical cell is revealed, and the two come to have an identical structure. The compact head of chromatin is quickly transformed into the usual nucleus after it enters the egg cytoplasm. The many recent experiments have but served to corroborate the earlier observations that the chromatin in the sperm head is the important part of the sperm cell. One cannot watch the sperm nucleus and egg nucleus in the ovum without being profoundly impressed. Here are two microscopic vesicles containing the structures that are to direct and be responsible for the future shape and peculiarities of the adult. It is but a short time until these two nuclei unite. Much has been written about the exact relations of the male and female chromatin in this process in an attempt to identify the paternal and maternal characters in the offspring. To biological investigations in reproduction, medicine will always be debtor.

Variation and Heredity.—To present in a paragraph or two the significance and scope of these two topics—topics concerning which many large books have been written—is, of course, impossible. In selecting which phases to discuss, the writer will try to present the more fundamental relations between biology and medicine. Old and young, the expert and beginner always take up this general problem with intense interest. We are all familiar with the fact that we are in many particulars just like either father or mother but differing enough to have a distinct identity. What are the physical agents that can be examined and studied in the problem? Whatever may be the ultimate analysis of the problem of heredity, there can be no hesitation in stating that the transmitted characters exist potentially in the protoplasm of the cell. From the egg of a robin only a robin will develop, from the ovum of an oak only an oak will grow, and during growth each follows its own successive embryological stages even to the minutest details. It has been well said that "Nature never yet made two eggs or two sperms exactly alike."

A great deal has been written concerning the relation of the chromosomes to the problem of heredity and variation until only those devoting much time to this phase of research are conversant with all the details. The group of experiments which come under the general head of centrifuging have served to indicate that the cytoplasm of the egg has its respective work to do in this process. But the chromosome devotees retort that the cytoplasm is regulated by chromatin that has migrated from the nucleus and is thus indirectly regulated by the nucleus. Along with this aspect of the question come the many contributions upon the inheritance and determination of sex. The insects have furnished the chief source of our information upon the accessory chromosome and its influence upon sex. The problem is not solved as yet, but much progress has been made. One of the interesting conclusions to which one comes upon studying the many papers upon chromosomes is the rather wide range in size and shape of the individual chromosomes. The fact that these chromosomes are of a definite number for each species, ranging as low as 2 in *Ascaris* and as high as 168 in the Crustacean, *Artemia*, introduces the question of the extent of the combinations possible in fertilization. We are coming to look upon the chromosome as a complex body which has the potential power, under appropriate conditions, of causing the developing cells to take on a given form. This does not mean that the chromosome or even the germ cell is a miniature adult that simply unfolds, but rather that the initial or determining cause is within the germ cell and that the full expression of characters comes through a continuous series of developmental stages which are determined by the more or less physical relations of the chromosomes as they unite in fertilization. One hears most speakers upon heredity using the term 'determiners' in this connection, in which they have reference to the independently acting units in the chromosome. The determiners are for the present entirely hypothetical bodies. Before making the further application of these facts we must add another elementary conception of great importance—namely, the nature of the characters upon which heredity and variation act.

For the past few years the name of Mendel is ever to the front as helping us to understand what is meant by an inheritable character. But long before we all knew about the wonderful work of this Augustine monk, men were studying the amount of variation in such characters as tallness, length of arm, color of eyes, hairiness, etc., in man, and similar individual characters were selected in animals and plants. Practically all the valuable recorded facts of variation deal with its extent in certain selected characters, but it did not seem to occur to anyone that each character might act independently in heredity, although the variation was in fact a proof that it has thus acted. The studies on variation and the rediscovery

of Mendelism served sharply to define the question until we naturally think of a definite character when the word heredity is spoken.

Two of Mendel's laws may be given to show their applicability. The law of dominance is stated as follows. When two animals or plants differing in some character are mated, the offspring frequently all exhibit the character of one parent, and the word dominant is used to express this condition. The character that does not appear is called recessive, for in subsequent breeding this recessive character will reappear in a certain proportion of the young.

The second law that the writer wishes to state is the one that has reference to the purity of the germ cells and is regarded as his great contribution to heredity. When two species are crossed the result is a hybrid. The hybrid, whatever its own character, produces ripe germ cells which bear only the pure character of one parent or the other.

These unit characters which are now widely recognized have in some cases a general distribution in the organism. Tallness and dwarfness are diffuse characters of the plant or animal as a whole. Hairiness may be on stems, leaves, calyx, part or all of them. These Mendelian units, then, are not the leaves, the arms, the hands, but qualities of these organs. The practical application of this modern conception of heredity, which was first worked out on plants and then on animals, has been to concentrate our attention upon a definite phase of this very broad problem. The results in breeding have been astonishing and the beneficial results a lasting help. It did not take long for this idea of unit characters, coupled with dominant and recessive, to suggest that an organism is capable of transmitting these units good or bad. This idea is really the origin of eugenics. What can we do to make our posterity better? This question represents one of the noblest expressions of human benevolence. It is inspired by the missionary spirit. The result has been to focus attention upon delinquents, idiots, etc., as portraying the lasting persistence of such characters through many generations. A new definition of human rights will be made in the near future just as a new one had to be made when the nature of biological diseases was understood. But few question the right of quarantine to-day, because we all recognize that we have a right to live and the man suffering from some contagious disease interferes with this right. The next right to be defined will be the right to be well born in the sense of having a well body, free from the taints of alcoholism, idiocy, delinquency, etc.

To return for a moment to the earlier question of the relation of the chromosomes and their determiners, if they are responsible for the adult expression of these unit characters then the fate of every individual is determined when the male and female chromosomes unite in fertilization. The die is cast and the lot determined past recall.

Much remains to be discovered concerning the full details of heredity and the cause of variation, although enough is known to enable us to lay down the principles upon which the physician may safely act and advise. Variation and heredity are two terms used to describe kindred characteristics of living protoplasm which are always present where life exists. They are as fundamental as metabolism and like it understood only in part.

In bringing this paper to a close we may merely note that biology has laid a broad and substantial foundation for medicine, especially the medicine of the future. Our work is by no means done. New discoveries to-morrow will throw additional light upon some of our present relations, or reveal new ones so that the physician who keeps abreast of the times in his researches must ever be alert to the progress of biology.

ORTHOPEDICS FOR THE GENERAL PRACTITIONER.*

By JAMES WARREN SEVER, M. D., of Boston,Junior Assistant Surgeon Children's Hospital, Boston; Surgeon to the House of the Good Samaritan.

There are many things in orthopedics which touch the work of the man in general practice. In fact, it might truly be said that all orthopedics originates with the man who is the family physician, in view of the fact that he is called first and is the first to recognize that there is some unusual element present in the case, or rather some element outside his daily routine and experience. If it is an affection of the nervous system, he has a 'nerve man' see the case, if an obscure disease of the genito-urinary tract a 'genito-urinary man,' if a gynecological trouble a 'gynecologist,' and if an affection of the bones, joints and muscles beyond his scope, we hope he sends for an 'orthopedic man.'

Now I am going to take up a few of these orthopedic affections, and will try to show you where they meet you in your work, and explain certain principles in the treatment of them which will, I hope, be of use to you.

I have purposely and carefully selected the following conditions, which are common in the daily experiences of almost all of us, and will try to outline to you the orthopedic interpretation and treatment of the cases. It seems to me that to do this will be of more real and practical interest and value to you than to approach the subject in any other way. The conditions I have selected are as follow:—

1. Limping in children.
2. Lateral curvature of the spine.
3. Congenital club foot.
4. Synovitis of the knee-joint.
5. Infantile paralysis.

Limping in Children.—It is an almost daily experience with me to see a child at the hospital brought there on account of a limp in one leg of a greater or less duration. It is also a common story to hear the parents state that the trouble is all in the knee. With the child stripped, an observation of the gait will, as a rule, at once disclose whether the trouble is in the knee, hip, or ankle. A further examination, with the child on its back on the table, will localize the trouble, which is generally in the hip.

Now pain in the knee, without anything to show for it at that

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point, usually means hip. The obturator nerve in its course to the inner side of the knee runs directly over the anterior portion of the capsule of the hip, and any disturbance in the hip-joint means pain in the knee. Do not fail, therefore, to examine the hip when pain in the knee and a limp are complained of, for this is one of the most common errors made. The hip-joint is usually found affected by tuberculosis in these cases, and the child usually has a joint which is painful, irritable, and a leg which is flexed by spasm, and which shows considerable limitation of motion.

Another not uncommon cause of a limp is found as a result of a fall or injury to the leg by muscle strain. In these cases there is usually a slight limp, a short duration, a sudden onset after the injury; and an examination shows generally at the most but a very slight limitation of motion at the hip, especially in the direction of outward rotation and hyperextension. The *x*-ray of the hip-joint usually shows nothing abnormal. These cases probably represent a condition of moderate synovitis of the hip-joint, analogous to 'water on the knee,' and readily clear up with rest in bed and a flannel spica. Identically the same symptoms may be found in other children, with often similar histories, but the children are always much too large for their age and generally quite obese. The *x*-ray shows a slipped epiphysis, and the best method of treatment is to apply a plaster spica, with the leg slightly abducted, and prevent weight-bearing by supplying crutches. More severe cases of this class require forcible abduction of the leg under ether, followed by plaster of Paris, and later a metal splint which will keep the leg abducted.

One such case was sent me several years ago by Dr. David Dow, of Cambridge. The patient was a boy about eleven, very large for his age. He had had a persistent limp for some time following an injury, and complained of some pain in the knee. The *x*-ray showed a distinct slip of the epiphysis of the neck of the femur as compared with the well leg. After great persuasion on my part, and much against the judgment of the boy's father, I was allowed to apply a plaster spica reaching to the knee. The boy was supplied with crutches, and in due course of time, that is in about six months, after several new spicas had been applied, and when examination of the hip showed that all irritation in the joint had subsided, he made a complete recovery.

Often one of the hardest things one practising orthopedics has to contend with is the parents' objection to the application of plasters, splints, etc., and above all to the great amount of time it takes to effect a permanent result which, from the parents' point of view in the treatment of many orthopedic diseases, seems endless. I might add that occasionally the doctor's point of view is a similar one.

There are numbers of other conditions which cause limping in

children, and which are generally more obvious than the ones of which I have spoken—namely, congenital dislocation of the hip, coxa vara from rickets or fracture of the neck of the femur, infantile paralysis, and affections of the knee and ankle. These conditions I will not discuss here, for I only wish to call attention in detail to the ones of which I have spoken, as being the ones likely to be overlooked.

Tuberculosis of the spine will also cause a limp in the following way. If a psoas abscess has developed it will probably cause a certain amount of flexion of the leg and irritation about the hip muscles, so that when the patient attempts to walk he will exhibit a certain hesitancy for which the cause can be found on examination. As a final caution never fail to examine the spine and iliac fossæ of any child brought to you for a limp unless the cause is perfectly obvious.

Lateral Curvature of the Spine.—This subject is at present much before the orthopedic men, and is one of great importance. It is to you, however, and particularly to those of you who are doing school inspection work, that I wish to emphasize the following points: Every child who carries one shoulder higher than the other probably has some kind of a lateral curve; every child, and this is especially noticeable in girls, who has a so-called 'high-hip,' and generally the dressmakers are the first to discover it, probably has a lateral curve. The observations of these two points alone will do much to insure a proper examination of the backs of these children, stripped to the hips, and, if a lateral curve is found, to insure its proper treatment.

The treatment of lateral curvature is too complex a subject to take up here in detail, but in a general way I would state that there are two classes of curves which need treatment: (1) Postural or physiological; (2) structural or organic. Each type requires a different method of treatment. In the first, proper exercises and readjustment of the clothing are usually sufficient, while in the second nothing but jackets, removal or permanent, with and without exercises, are of any possible benefit.

In the structural cases it is well to go by the rule that it is not wise to give exercises to any case unless you are prepared to hold what you have gained by proper and adequate mechanical support—in other words, if neither the patient nor you are prepared to put the thing through on a business basis judged by results, it were on the whole better not to start. This does not mean that no treatment is necessary, but that poor, insufficient and inadequate treatment is worse than none. You can readily see that when a spine is made more flexible by exercise it will consequently slump into a worse position than before, unless the improvement is held by a brace or jacket. Unless a patient is willing to recognize this and co-

operate in the treatment, a disappointment both for the doctor and the patient is inevitable.

Congenital Club-Foot.—Now you are all familiar with congenital club feet, and it may seem strange to you that I should refer to apparently so simple and well known a condition. But when I tell you that a club foot improperly treated is one of the most difficult and lasting problems we have to meet, it will not seem too strange that I wish to emphasize certain points in the treatment.

Club feet can be absolutely cured and normal feet obtained if the child is given adequate treatment early enough. By that I mean within the first eight weeks of its life. This can be done without operation. Do not tell parents to wait until the child is one, two or three years old before having anything done, but tell them to start treatment at once. Time lost at the start can never be regained, and the earlier treatment is begun the more normal the foot which the patient will have later in life. This I know from long experience with many club feet. At the Children's Hospital the earlier we get a case the better we like it. These cases have a plaster cast applied without ether, and it is renewed every two weeks at first and at longer intervals later, until the over-correction is easily held, when a brace is applied. The plaster cast is applied and allowed to harden with the foot held in as much of an abducted, everted and dorsally-flexed position as possible. Each time it is renewed there should be a distinct gain in the position, that is, in the young babies. The knee is flexed to prevent the cast from twisting on the leg, which would allow the foot to go back to its former position. Too much padding should not be used, for the foot will slip inside of it. The circulation should be most carefully watched, and it is often advisable to bivalve the plaster cast before allowing the child to go home. The parents should be instructed to watch the color of the toes and note any undue swelling, and should report for observation frequently. By applying these casts every two weeks the most severe deformities can be over-corrected, and by over-correction only can any club-foot be cured. Over-correction as applied to a club-foot means a foot well everted, abducted, and capable of full dorsal flexion. Later, when the over-correction is complete, massage, a light brace for six months to a year to hold the over-correction, and constant use of the foot in weight bearing, if the child is old enough to walk, are the measures indicated.

Older children, with club feet which may or may not have been treated, usually have to undergo bone operations and tenotomies, which are at the best mutilating, and rarely give as good a subsequent result; and the existence of the condition in a child of several years who has been allowed to go untreated, is but a reflection on the medical men for their failure to educate the families under their care to the necessity for early and immediate procedures.

Synovitis of the Knee-Joint.—This most common condition may be due to many causes, but as usually seen is generally the result of trauma, and is known as acute synovitis of the knee, or water on the knee. The treatment is simple, but in spite of that I find that there are nearly as many ways of treating such a condition as there are different physicians. There are definite indications to meet, however, in every case. These are to fix the joint, to prevent weight bearing, to diminish the pain and tension in the joint, to get rid of the excess synovial fluid, and to restore function within a reasonable time without too great loss of power from muscle atrophy in the leg. Now there are certain definite ways of accomplishing all this.

First, apply a ham splint, or a plaster cast from the ankle to the groin split down each side, and have the patient go to bed or keep the leg in a horizontal position. Secondly, apply an ice bag over the knee; fasten this on by a many-tailed bandage and keep it in position for at least forty-eight hours, when it will be found that the pain has gone and the swelling generally much diminished, meanwhile protecting the skin with a piece of flannel. Many men believe in tapping the knee-joint when it is much distended with fluid, and do this in their office with a trocar. They can do it if they wish to assume such a responsibility, but the more I see of knee-joints the less I want to go into them under any conditions, and least of all in such a way. The fluid will always go down under the treatment described if given a chance, and I do not believe that tapping should be done except under exceptional conditions and then with extreme surgical precautions. After the first few days let the patient get about with crutches without weight bearing, and start baking by electric light, and the use of gentle massage. The massage should never be used directly over the knee-joint, but should be applied to the muscles of the thigh and calf. If the swelling goes down well and the pain stops, do not start passive motion, but take the splint off by the end of the first week, bandage the knee with a flannel bandage, with a felt horseshoe pad about the patella to keep the direct pressure off it, and allow weight bearing, with what use in flexion the patient cares to give the joint. In this way you can get your patient well more quickly than usual, have a better joint, and a more useful leg than under the old regime, where the splint was put on and left for at least three weeks, at the end of which time the joint, although it might have no fluid in it, was absolutely motionless and stiff, and several weeks more were spent in recovering lost motion and regaining muscle strength. This last statement is not an exaggeration but the result of painful personal experience. Intelligent use of the joint, even if it has a little fluid in it, does it far more good than all the fixation in the world, and makes for a better and quicker convalescence.

Infantile Paralysis.—This disease is one I believe we all dread.

It has left us, and is still leaving our various communities, dotted with many cripples. It has been before us all so much of late in an etiological and pathological aspect that I shall not attempt to touch on these points, but will merely point out the common symptoms and the essentials of the early treatment, which properly carried out lighten the subsequent labors of the orthopedist, to say nothing of the patient.

It occurs most frequently in children between the ages of two and three years, and the early symptoms are very varied. The most common ones, however, are fever, tenderness over the affected parts, vomiting, constipation, and at times retraction of the head. All these symptoms may vary. Often the parents tell me that the child went to bed all right, but complained of feeling tired, and woke up paralyzed.

The paralysis may make its appearance at once, and in the majority of cases usually appears during the first four days. The parts involved are, as a rule, one or both legs, a leg and an arm, both arms and legs, and the back muscles of the trunk. It may be stated here that the character and severity of the onset and the distribution of the paralysis give no indication as to the ultimate prognosis. Cases apparently severely crippled may make a complete recovery, and it is a fact that about 15 per cent. do so recover. The cases, however, which are going to regain complete control of their musculature do so generally within a period of three months, and I have seen them do so in three weeks following an almost complete paralysis of the arm and legs, although in many cases which do not make a complete recovery there is often a slow and gradual improvement in the muscle tone over a period of years.

The diagnosis of these cases is usually easy *after* the onset of the paralysis; and there are no positive signs at present by which one can make a diagnosis before the onset of the paralysis. Sudden onset, motor paralysis, absence of reflexes, cold extremities, tenderness or pain, no loss of sensation, and later muscle atrophy, mean but one thing—namely, infantile paralysis.

Having an acute case of this kind, the question is what to do. First of all, insist on absolute rest and quiet and free catharsis. Have the child on a hard pillow or a Bradford frame. Next, following the acute period, it is of the utmost importance to prevent stretching of the paralyzed muscles, and if the legs are involved it is generally wise to put them in plaster casts or troughs, keeping the feet and legs in the normal and proper relations. If the arm is involved there is usually a paralysis of the deltoid and trapezius muscles, allowing the shoulder to drop and the arm to drag. There is, of course, no power then to raise the arm, and consequently, unless supported, the shoulder ligaments become very much stretched and relaxed. The arm should be supported either by a sling holding up the elbow, or better by a properly applied splint

which holds the upper arm at a right angle to the body and at the same time supports the lower arm and hand in the same horizontal plane. By doing this, subsequent contractions and deformities are prevented. If the paralyzed parts are cold, wrap them in cotton, but be sure that all pressure from bedclothes and dragging from bad position, which cause an over-stretching of the paralyzed muscles, are prevented. Massage and electricity are not to be used during this stage—in fact, electricity rarely does good in any stage and its use has largely been given up.

Following the subsidence of the acute attack the child should be kept in bed for several weeks, with the paralyzed parts protected as suggested, and the massage should be begun, but should be most lightly applied and used. Then should come the fitting of braces if necessary and such apparatus as is needed to make getting about possible, together with the prevention of deformities. During this period, massage, muscle training and operative procedures are indicated. It is not wise to operate within two years of an attack, nor on too young a child, except possibly to do a tenotomy for a contraction. Tendon transplantation and the insertion of silk ligaments for the correction or prevention of deformities, and the removal of bones such as astragalectomy for flail foot, or arthrodesis of joints, are procedures which are best done later in life, that is, in the second decade, and should be planned most carefully after a thorough study of the needs of the individual case.

This is but a sketch of what I could say to you on this most interesting subject, but I believe that if I started to tell you how to treat each individual deformity which occurs, with a description of the apparatus and methods best suited for its correction, the afternoon would stretch into evening and I should find myself talking to empty benches.

There are many other interesting conditions seen and treated by the orthopedist besides the ones I have described. We see many pairs of feet, and I can assure you that they are as purely individual in their idiosyncrasies as the persons may be to whom they belong. They are weak feet, flat feet, painful and irritable feet and stiff feet, all of which need different methods of treatment, from simple exercises and properly balanced shoes to plates and stretching, forcible manipulation and tenotomies under ether, followed by fixation for several weeks in plaster casts. There is also the well-known condition of hallux valgus, better known probably by its more euphonious name of bunion, a pure shoe deformity to which, when severe and giving discomfort, surgical measures alone give relief.

Now, I hope that you have been able to gather a hint here and there from this paper which will be of use to you in the future. One thing I should like to impress upon you before closing, and that is that the work of an orthopedist is often laborious and long drawn

out, and that his results are often obtained by skilful guiding of the natural reparative processes rather than from a single brilliant operation, whatever we may say to the contrary. We would like to get our cases well quickly, but we unfortunately cannot do so as a rule, for the very pathology of the diseases we meet, involving as they do the bones and joints, precludes any such possibilities. Careful, intelligent and long-continued treatment, after necessary orthopedic operations, is often of far greater importance than the operations themselves, especially when interpreted by the ultimate result. So bear with us. Gentlemen, I greet you all as embryonic orthopedists.

234 Marlborough St.

THE TRANSMISSION OF TYPHOID FEVER.*

By C. L. OVERLANDER, M. D., of Boston,
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No other disease, with the possible exception of tuberculosis, is receiving so much attention in the medical world to-day as is typhoid fever. It is well that it should, because in this universal stimulation of interest lies the hope of its final extinction. Fortunately the bacteriological origin of the disease is known and this defines lines along which we can work.

Typhoid fever is now regarded as a contagious disease, not in the same degree that scarlet fever, measles, or mumps is contagious, but similar to diphtheria and meningitis.

Modern sanitary science, which has solved many problems of disease, regards it as a filth disease, and therefore it is a serious reflection upon the people of any community where it exists. The suffering and deaths are emphasized when we consider that, in the Census Report for 1900, there were 35,379 deaths in the United States that year from typhoid fever—a preventable disease.

According to Whipple's calculations this represented a loss to the country of \$212,000,000 for that year alone, if its ravages are to be reckoned on a monetary basis.

This same author places the average death-rate in cities in the United States at 35 per 100,000. In view of these facts, it is not surprising that the interest and efforts of the medical profession should be aroused and means devised to combat it.

The etiology of the disease having been established, one of the first things for consideration is the modes of transmission. In the past few years our knowledge concerning the avenues by which this disease is transmitted has increased a very great deal. Indeed, there are few diseases about the spread of which so many convincing facts have been recorded, and none of the widely prevalent infections promises better results for an equivalent amount of effort at prevention than does typhoid.

It is the writer's purpose, therefore, to consider briefly some of the modes of transmission of typhoid fever and how to recognize them. It is a well-established fact that every case of typhoid fever comes from a previous case either directly or indirectly. This knowledge has done much to stimulate interest and research in the modes of transmission of typhoid, and from this alone it would seem that the control of this disease would be a very simple task.

*Read before the Medical Society, Woonsocket, R. I., September 11th, 1913.

The avenues by which it is carried from one individual to another, however, are very numerous and sometimes in such an indirect way as to point suspicion in the wrong direction entirely.

One of the earliest views was its transmission by means of water. This is, without doubt, a possible source, and in some epidemics has been shown to be the medium of transmission. It occurs when the excreta, not disinfected, during the acute or convalescent stage of the disease, gain access to the water-supply, whether such supply be the city supply, from a well, spring, lake, or river. We can all recall epidemics where the organism was transmitted through water, but fortunately these are becoming less frequent and it is now the exception to find an epidemic in a city due to infection of its water-supply. Such epidemics, when they occur, are characterized usually by an explosive onset as is well illustrated by the epidemic in Plymouth or Butler, Penn., or more recently the one in New Haven, Conn. A sudden infection of the water-supply which previously had been good gives rise to an outbreak appearing abruptly and covering an area which takes its water from that particular supply. Its occurrence among persons using the water is entirely independent of age, occupation, or environment, except that, as a rule, very young children are less affected in proportion to the other cases. This may be accounted for either by a difference in susceptibility or by the fact that infants take less water and are, to that extent, less exposed. The theory advanced by some writers in support of the view of diminished susceptibility in infants is that in mother's milk there is a substance which in some way inhibits the action of the typhoid bacillus or increases the resistance in the individual it would attack. This was made the subject of an investigation by Denny¹ who gave mother's milk to patients ill with typhoid fever. These patients were being treated in the hospital where they could be carefully observed. He concluded that human milk did not in any way affect the course of typhoid fever. The criticism might be justly made, however, that the patients upon whom this was tried were already ill with typhoid and therefore it was not a test of initial susceptibility. Furthermore, it is not justifiable to draw conclusions as regards the susceptibility of infants to typhoid fever, who normally receive mother's milk, from experiments carried out on older persons.

Once the water-supply is infected the outbreak will continue until the sources of infection are removed or there is a change in the supply. Removal of the source of infection results in a gradual diminution in the number of cases. If a new pure water-supply is used the decrease is likely to be sudden and very marked. Secondary cases of infection may tend to keep the number above that which is normal for that community.

In the Lowell outbreak in 1890, as well as the one in Lawrence in 1892, where the source of infection was continued for a considerable time, the decline was much less abrupt.

If the water-supply is a river, continuous infection is the more likely, and the increased number of cases in late summer and autumn is due in no small degree to the fact that as the number of cases increases which supply the infection to the stream, the amount of infection is correspondingly increased.

Certain factors influence the distribution of the typhoid bacillus in water as pointed out by Anderson.² Of these, he mentions seasonal prevalence as an important one because of the frequency of epidemics in the spring or late winter. Where the water-supply has been previously good, the outbreak occurs in the late winter or spring months as exemplified by the outbreaks in New Haven, Conn., and Plymouth, Pa. These are explained on the theory that the excreta are thrown upon the frozen ground and when the thaw comes, they are washed into the stream. This explanation would not suffice if the supply is infected by reason of failure of purification methods used, or by a change in the source of the water-supply. Another evidence of water-borne infection is that the outbreak may begin or end following the change of the water-supply. Wherever a previously good supply has been replaced by an unknown one, or a suspected supply by one of known purity marks the beginning or ending of an epidemic, it points strongly to the water as the source of infection. Again, freedom from typhoid of persons not using the suspected water, as those who use bottled waters or boiled water or where there is more than one water-supply, is evidence of water-borne infection. A good illustration of this is furnished in the epidemic at Butler, Pa., where one part of the city obtained its water from deep driven wells and was free from typhoid.

It should be remembered that carbonated waters are not always safe. In India bacteriological examination of carbonated waters showed that carbon dioxide had little or no influence on the viability of the typhoid bacillus. Various bottled waters and soft drinks made from infected water are as dangerous as the water itself and perhaps more so because taken with less caution.

Bacteriological and chemical examination will reveal evidences of pollution in water, but it is very difficult or is even practically impossible to find typhoid bacilli in water.

One is usually content with condemning a water as polluted which contains *B. coli* or chemical evidences of pollution.

The water may show evidences of pollution at one time and not at another, as was found to be the case in Washington and again in Detroit. Wherever a water-supply is variable in bacterial or chemical content, it is dangerous. It means, as a rule, a source which is intermittent and points to surface contamination or sewage pollution.

In tracing the source of an outbreak of typhoid fever to the water-supply, one should study carefully all the conditions and

exclude other sources of infection, such as milk, foods, contact, insects and imported cases.

The bacillus rarely if ever multiplies in water to any great extent and its viability in water is distinctly limited.

Transmission in Milk.—Unlike water, milk that is not kept cool furnishes an almost ideal medium for the multiplication of the typhoid organism and it may be teeming with bacilli without any change in its physical properties, that is, color, odor, or even taste. The bacillus enters milk in one of many ways, usually, however, by direct or indirect contact with a case of the disease, for it not infrequently happens that the same hands that nurse the sick, milk the cow and do the cooking.

Many other means are offered, as washing the milk cans with infected water, rags used in cleansing the cans, by insects, by direct contact with carriers—those coming down with the disease, convalescing from it, during the disease in mild or ambulatory cases—or, in the absence of a sterilizing plant at the dairy it may be carried to the milk through bottles delivered to customers where cases of typhoid exist and these returned to the dairy, filled and delivered to others.

An outbreak due to milk is characterized by the sudden appearance of a large number of cases followed by a rapid decline. Cases appear suddenly on a certain milkman's route or among customers whose milk-supply comes from a certain dairy or farm. It may be characterized by the same explosive violence as a water-borne epidemic, but usually the outbreak will vary according to the source of the infection. For instance, if that source is flies, there is a sudden rise followed by a sudden decline in the number of cases; if by a carrier, the onset would be more gradual and the decline delayed.

Another evidence of milk-borne infection is indicated by the sudden appearance of typhoid cases among the customers of a certain dairy without a general increase elsewhere. This was well illustrated in the Jamaica Plain, Mass. epidemic.

We must not forget, however, that infection from other sources than milk may occur among persons supplied by a certain dairy, but these will not be found to be chiefly consumers of milk. It is very often possible to trace cases, not directly supplied by the suspected dairy, by the fact that they have taken this milk at the home of some friend or at a restaurant supplied from the suspected dairy. The unusual proportion of cases on a given milk route is often striking, especially if this occurs in a city where the cases outside this route are diminished in number. Again, the very large number of cases among those who use milk is often noticeable. Members of the same household who do not use milk escape or develop typhoid as secondary cases. This is well illustrated in the predominance of women and children attacked.

Still another characteristic of milk-borne infection is that there are more cases among the well-to-do than among the poor, because they are able to buy milk and use it in larger quantities.

In a very careful and extensive study of the "Origin and Prevalence of Typhoid Fever in the District of Columbia,"³ it was found that in a study of 866 cases of typhoid reported from June 1st to November 1st, 1906, about 10 per cent. were attributable to milk.

Here typhoid was more prevalent among those in residences of the better class who used more milk. In Strasburg, Kayser⁴ estimates that 26.7 per cent. of typhoid is due to milk-borne infection.

Pasteurization of the milk stops the epidemic except for secondary cases, and it is fairly agreed that if such pasteurization is done properly it does not injure the food value of the milk. This means of prevention has been recommended by Rosenau⁵ as the one most likely to succeed in preventing milk-borne epidemics, but care is necessary that the milk is not subsequently infected.

The opposition to pasteurized milk is that it tends to make the handlers of it less careful and it is argued that a dirty milk would result.

Typhoid Carriers.—It has been known for a long time that persons apparently well may harbor the cholera vibrio in the intestinal tract, diphtheria in the throat, or the meningococcus in the nose. These facts are recognized and are appreciated in prophylaxis, but it is only a comparatively few years since it was shown that the same relationship might exist with regard to the typhoid bacillus. As a result of this discovery, great importance is being laid on the discovery of carriers in the transmission of typhoid fever.

A carrier is one who, while he is apparently well or convalescing from typhoid fever, excretes typhoid bacilli in the urine or feces or both for a greater or less length of time. Ordinarily this follows an attack of typhoid fever, but a fact of greater interest is that one may pass bacilli in the stools who has never been ill with the disease—the so-called 'acute carrier.' Most of these at some time have been in association with persons actually sick, but themselves experiencing no illness.

Drigalski and Conradi⁶ found typhoid bacilli in the stools of four individuals who, though they had been in contact with sick typhoid cases, had remained well. Other cases are recorded in which both the urine and the stools have been positive for typhoid bacilli without any history of previous illness.

According to the German writers, a chronic carrier is one who, after having had typhoid, continues to excrete typhoid bacilli in the stools or urine for a period longer than twelve weeks after the temperature has reached normal. The excretion may continue for weeks, months, or years after the attack.

The writer working with others at the Boston City Hospital⁷ found that 23 per cent. of 60 cases convalescing from typhoid were

excreting the bacilli in the stools or urine, or both, during the last ten days of their stay in the hospital. This is a higher percentage than that generally found, but it should be remembered that it does not represent chronic carriers but the incidence among convalescents. After their discharge from the hospital, the writer followed the positive cases for one year, examining three stools, three urines and testing the blood for the Widal reaction each month, when all could be obtained. This work is yet to be reported upon, but it may be said that the results will show a higher percentage of carriers than is usually given. According to various investigators, the percentage of chronic carriers ranges from one to seven with an average of four. This refers to those who excrete bacilli in the stools, while for those who excrete bacilli in the urine during or after the disease the figures given range from 24 to 27 per cent.

It can be stated that the organisms persist longer in the stools than in the urine in those who become carriers.

This question of carriers is further complicated by the fact that the excretion of the bacilli is not constant⁸ but intermittent, and many examples in the literature lend support to this view. Some have attempted to demonstrate a definite seasonal prevalence for the excretion of the bacilli by the carrier, as the early spring months and the early autumn months, but too few cases are reported as yet to admit of positive deductions.

Davies and Hall⁹ working in England, and Semple and Greig¹⁰ in India, have shown the intermittent periods to be from thirty to seventy-five days. This adds to the difficulty of attempting to rely on bacteriological examinations to determine when one who has been a carrier is no longer a danger to the community and when restrictions as regards the occupation of such a person shall be removed.

The length of time during which one may continue to excrete typhoid bacilli in the stools or urine is not known.

In the acute carriers this is believed to be a very short time. The longest period for a chronic carrier which the writer has found recorded is one reported by Gregg¹¹ of a woman who had probably been excreting bacilli constantly or intermittently fifty-two years after recovery from the disease. She kept a boarding-house and was probably responsible for at least 7 cases of typhoid occurring among her boarders. A second infection with the typhoid bacillus in her case was considered as quite unlikely. It is interesting to note among chronic carriers the frequency with which they are associated in some way with the handling of food-stuffs which makes them all the more dangerous.

Another case reported by Dean¹² is that of a physician who had suffered from repeated attacks of gall-stone colic with jaundice. He gave a history of having had typhoid twenty-seven years previously, but aside from these attacks was in good health. As far

as known he had not been the cause of any cases of typhoid, which may be attributed to his cleanly habits—a fact which offers much by way of suggestion in the prevention of typhoid transmission by carriers.

The place of abode of the typhoid bacillus in those who excrete them in the stools is pretty generally conceded to be the gall-bladder. In support of this view, it has been shown frequently that the nucleus of gall-stones found at operation is typhoid bacilli in pure culture. Again, typhoid bacilli have been found in the gall-bladder in pure culture in cases of cholecystitis, and one or two carriers have been treated successfully by operation and drainage of the gall-bladder. Autopsies on chronic carriers, who died of some other disease, also furnish evidence of this.

Another interesting observation is that gall-stones are about three times as common in women as in men, and in the tabulated cases of carriers this same relation exists—namely, three times as many women carriers as men.

In typhoid bacilluria the urinary bladder is the organ under suspicion, as it is well known that urine, especially if it contains albumin, is an excellent medium for the growth of the typhoid organism. Recently, however, Marchildon¹³ has supplemented our knowledge of this subject by post-mortem findings in the genito-urinary tract. In 2 fatal cases of typhoid, he found typhoid bacilli in the seminal vesicles and the prostate. This is analagous to what has been observed by Huet¹⁴ in male animals kept for breeding purposes. He found that the males transmitted to the females diseases from which the males had long since recovered, and gave as an example influenza in horses. This is extremely interesting because this disease in horses like typhoid in man is not ordinarily localized in the generative organs. In view of these observations, it seems quite probable that, during typhoid, the bacilli may enter the seminal vesicles and prostate, and there occasionally give rise to a chronic infection which can become the source of typhoid bacilluria of grave sanitary danger.

Medical literature is pregnant with reports of cases of the typhoid carrier as the cause of epidemics or of isolated cases. No better example is furnished in our country than the case of 'Typhoid Mary' worked out so carefully and completely by Soper.¹⁵ This woman, in eight or nine years, while working in six or seven different families as a cook, was the cause directly or indirectly of 27 cases of typhoid fever with three or four deaths. The collected reports of similar carrier cases make it possible to extend the discussion of this phase of the subject far beyond that which time and space will permit. Let it suffice to say that enough evidence has accumulated to make this source recognized as a real danger, and that it is a very important factor in the prevention of this disease.

Transmission of Typhoid Bacilli by Insects.—The agency of in-

sects, especially flies, in the transmission of typhoid fever is well known epidemiologically and bacteriologically.

Firth and Horrocks¹⁶ have demonstrated that flies may carry the bacillus and infect media or material upon which they walk. Their paper furnishes evidence that the external parts of the body and not the excreta carry the bacilli. In the Spanish-American war, Reed, Vaughn and Shakespeare,¹⁷ in commenting on the spread of typhoid fever in army camps, called attention to the fly as the most important factor, and Dutton¹⁸ reports that frequently flies were seen on the mess-table, whose legs and wings were covered with lime used in sprinkling over the excreta in the pits. If lime was carried about, it requires no stretch of the imagination to understand that typhoid bacilli could be transported from infected material to the food upon the mess-table. Hamilton¹⁹ captured flies on the yard fence and other places after they had left typhoid dejecta, and was able to demonstrate that they did transport the typhoid organism.

Ficker,²⁰ in 1902-3, infected flies from blotting paper which had been soaked in a bouillon culture, and found the typhoid bacillus could survive at least twenty-three days in or upon the fly. The typhoid organism can be isolated from the excreta of flies as well as from the external parts of the body so that a fly thus infected may transport the bacillus to distant parts far away from the contaminated material. The character of the outbreak due to flies has been referred to above.

Other insects that are capable of transmitting typhoid fever are mosquitoes, ants, roaches, bedbugs, and fleas. Of domestic animals, that may be instrumental in its transmission, may be mentioned mice, rats, and dogs. Wiener²¹ points out that typhoid bacilli are liable to remain alive in rats for at least a month after typhoid dejecta have been eaten by them. From the dejecta of the rat, articles of food and water may be infected.

Contact Infection.—The great importance of contact infection, direct or indirect, in the epidemiology of typhoid fever is receiving increased attention each year. In the series of cases studied in Washington,²² referred to above, 6 per cent. was attributed to contact infection. That this is really an important factor is amply demonstrated in a paper by Joslin and Overlander.²³ Remarking upon the incidence of typhoid fever among hospital nurses and attendants, it was noted that, up to three years ago, it very rarely happened that a year passed without one or more cases of typhoid occurring among nurses or ward attendants in all the larger hospitals. A statistical study revealed the fact that nurses and those in attendance upon patients ill of typhoid were eight times as likely to become infected as was the individual not associated with typhoid cases. It is to be remarked that during the past three years at the Massachusetts General Hospital, no case of typhoid has developed

within the hospital among the nurses. This is attributed to preventive inoculation which has been extensively carried on by Spooner.²⁴

Dust.—Infected soil blown about as dust is a source of infection about which too little has been said. Attention was called to the importance of this by Barringer²⁵ who criticised the modern railway closet and the infection of the roadbed by persons traveling over it during the infective stage or during convalescence. He suggests that this might help to explain an appreciable amount of typhoid fever not traced to any other source. Persons affected are those living permanently along the line of the road; those away who travel or whose vocation has brought them into temporary contact with the road and its influences. Secondary results are seen in the infection of streams, brooks, creeks and rivers as well as springs and wells, and constitute a real danger for every village, town or farmhouse along every line of railroad. It has long been observed that a railway journey greatly increases one's chances of typhoid fever, and this offers a very possible explanation. It would seem that railroad employees are especially prone to typhoid. It is very frequent among traveling salesmen. The percentage of typhoid patients in railroad hospitals who are trackmen, section bosses and section hands is very high. In India, where conditions are favorable for typhoid infection from dust, Harrison and Harrison²⁶ were able to isolate the organism from dust one hundred and eighteen days after infection.

Of considerable importance is the transmission of typhoid on uncooked vegetables, meats and fruits which have been exposed to dust or are grown on soil where human excreta has been used as fertilizer. This brings up the question of the viability of the organisms in soil, which has been worked out with considerable care, but space is too limited to permit of more than simple reference to it.

Of uncooked vegetables, celery and lettuce are the chief offenders, and epidemics have with certainty been traced to these sources. Other articles of food which may transmit the bacilli are butter, buttermilk, cream, and ice-cream. Bacteria are more numerous in cream than in skimmed milk, according to Bassenge.²⁷ It is known they will live in cream ten days after infection. In buttermilk they are viable for ten days and in butter made from cream containing them, the bacilli have been recovered up to the twenty-seventh day. In fact, they even multiply in butter the first few days. The butter may become infected by rinsing the churn with infected water.

Ice-cream is not fatal to the typhoid bacillus and may be especially dangerous because often the worst milk is used in its making.

Shellfish come in for their share of comment in the transmission of this disease. Until recently no complaint had been made

against the lobster, but now this charge faces it following a dinner in New Jersey where lobster salad was prominent on the menu. The suggestion is made that the infection may have been caused by some other ingredient of the salad, some other article of food used in the meal, or by a carrier who handled the food.

Ice was first suspected as a possible source of typhoid infection when it was shown that the typhoid bacillus is not killed by freezing. Sedgwick and Winslow²⁸ contend that transmission in ice is of very rare occurrence, because in the natural freezing of water a large majority of the bacteria (90 per cent. or more) are thrown out by extrusion or die due to a forced storage of weeks or months. We now have more light thrown upon this by the recent work of Kieth,²⁹ who believes it is not the temperature or extrusion that rids ice of bacteria but rather the crushing action of the ice crystals as they are formed. Cold, however, reduces very greatly the viability and virulence which in disease germs are very closely related.

The epidemiology of the disease shows that it follows best a direct and quick transfer of the infectious material from the patient to the susceptible victim, and in support of this view it is pointed out that there are very few epidemics traced directly to ice. Cities like Lowell and Lawrence, Mass., and New York have used ice from polluted streams, yet maintain a low death-rate from typhoid fever, and this lends strength to the view that natural ice is rarely a cause of typhoid fever.

Neufeld,³⁰ Park,³¹ and Dorange,³² however contend that transmission of typhoid in ice is a possibility, though the proved cases are very few. Hutchings and Wheeler³³ reported the recurrence of typhoid fever in the St. Lawrence State Hospital in New York where the water-supply was changed and was shown to be good, while the ice supply remained the same. They recovered the typhoid bacillus from the ice, together with the colon bacillus. With artificial ice the conditions are somewhat different because it is made from water frozen solid and, as a rule, quickly consumed, so that neither sedimentation nor storage had time to act. It should be made from pure water that is above reproach.

Fabrics.—Attention was called to the transmission of typhoid by fabrics by Reed, Vaughn and Shakespeare;³⁴ also by Parkes,³⁵ in 1903, who recovered the typhoid bacillus from blankets which had been shipped to England from South Africa without being disinfected. Typhoid fever soon developed and the infection was shown to have been carried in the blankets. The viability of the organism in the blankets was at least six months. Firth and Horrocks³⁶ found typhoid viable seventy-four days after inoculation of khaki. The viability is somewhat variable depending upon the kind of fabric infected.

Pfuehl³⁷ used dried linen and recovered the organism ninety-seven days after infection; dried on threads and kept dry *in vacuo*,

two hundred and seven days; dried over sulphuric acid, two hundred and thirteen days.

Much more could be said concerning the transmission of typhoid fever from one individual to another. The more common means together with some of the rarer modes of transmission have been referred to briefly.

If we have a safe water-supply and a safe milk-supply, the fight against this disease must be waged along the same lines as for any contagious disease. This is now being done in many places in our own country with the result that the lowered morbidity-rate rivals that of the best German cities.

We have now at our command a most valuable means of prevention in vaccination. This has been so thoroughly tested and with such positive results that its value is no longer to be questioned. It remains for each one of the medical profession to familiarize himself with it and urge its use as second in importance only to vaccination against smallpox. He should not wait until there are cases among his patients, nor until there is an epidemic in his or an adjoining community, because the greatest value in this procedure lies in giving it before the onset of the disease, though it is believed to be of some value in rendering the attack less severe even if given after initial symptoms have appeared.

The education of the public regarding this means of prevention, as well as in the various modes of transmission of this disease together with its co-operation in the fight against it, not only in one community but in every community in every civilized country, is essential if we are to stamp it out.

Every physician who has under his care a case of typhoid is given the opportunity to spread this knowledge, and he is neglectful of his duty if he fails in this particular.

In conclusion, may the writer express the hope that those who have had the patience to read this paper will find in it something to stimulate their interest in checking the spread of a disease which in itself seems so simple, but is surrounded by so many little difficulties in its complete prophylaxis.

I have quoted freely from many authors who have written on various phases of this subject, most of whom I have mentioned in the text. I give below a more complete bibliography.

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MASTOIDITIS—A COMPLICATION AND AN ENTITY.

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Physiologically speaking, the mastoid cavity is a part of the middle ear and probably is involved in all cases of acute suppurative otitis media. There is a time, however, in the beginning of such cases when the tympanum is the seat of trouble, and limitation here by early free incision of the drum may prevent extension to the mastoid cells; and from this fact and another—that the mastoiditis developed may so overshadow the primary focus of the process in all immediately important phases—it may well be considered as a complication of tympanitis.

As to whether mastoiditis ever begins as an independent affection, except as a result of trauma (in a case following several weeks after a felonious sandbagging the writer was called in consultation a few months ago) there is reasonable ground for doubt and that supported by many high in authority.

These cells are so thoroughly protected by their bony surroundings and are reached naturally only by such a circuitous route by way of the Eustachian tube, tympanum and aditus that their exclusive invasion by pathological processes is next to if not impossible. Yet there are those not infrequent forms of subacute and chronic mastoiditis which have been coincident with or have followed and continued after tympanic inflammation. These cases may be considered essentially as entities. With them there may be a drum of practically normal appearance and the hearing so slightly reduced that only exact testing will develop that fact; and yet operation or autopsy confirms a diagnosis of or reveals a suppurative mastoiditis with varying degrees of severity. The aditus in such cases, it need hardly be said, is found closed.

Mastoiditis, whether it be a part of otitis media, a complication or an entity, is always a cause for very serious consideration, not only in itself but from its influence on and its likelihood to be complicated with other extra as well as intracranial pathology. It is probably the most frequent cause of chronicity of otorrhea, and is the inaccessible well in local treatment for its relief and for lurking points of infection for recurrences and exacerbations. The mucous surface in the tympanic cavity is so small that any very material amount of discharge from it must have been augmented by the mastoid region. The continued irritation of the tympanic structures by discharge, by reinfection, by exacerbation, may reasonably be held as the most important factor here in the production of

hyperplasia, adhesions, ankylosis and osteitis, which, singly and together, seriously impair or destroy the value of the ear as a hearing organ more frequently than all other causes.

The causes of mastoiditis, leaving out of the discussion the comparatively few cases resulting from direct injury, are mainly those of otitis media, among which may be mentioned, as of superior importance, obstructions of throat and nose that in like manner affect the Eustachian tubes: adenoids are probably second to none in importance or frequency, and degenerate tonsils, especially of enlarged and submerged types, usually associated with them are among the most notable predisposing agents. Nasal insufficiency or occlusion, in the writer's opinion expressed in a paper on that subject,* forms the basis of a large percentage of adenoids and is with or without them a very frequent determining factor in producing and directing infection into the auditory structures. Epipharyngeal tumors, especially adenomatous growths in the region of the Eustachian orifices, deserve more than mention, as also strictures of the tubes themselves which admit extraneous material under the force of the upward current, but retard or repel its less forcible return. These are predisposing conditions, as also might be mentioned lowered general health, vitality, and resistance, or, if it could be known in advance, opsonic index.

With these or any of them obtaining, infecting material is harbored and furnished with salubrious conditions for multiplication and increased virility from a lack of drainage and ventilation, and there needs only a nidus of pus from a suppurative point, a minute modicum from a polluted atmosphere, or a contact with exanthemata, and the most important means of human contact—the sense of hearing—is endangered. Of the exanthemata, scarlet fever easily takes the lead, with measles second. Streptococcus infection of the middle ear is the most important form, the influenza bacillus frequently leading the way and the pneumococcus, in mixed and pure culture, a competitor both in frequency and virulence. The forms of staphylococci, while frequent, do not usually make so important a figure, save occasionally as they seem to modify the virulence of other strains. The streptococcus mucosus is not infrequent, and by its peculiar proneness to quiescence, followed by exacerbation of great virulence, is in a class of its own. Of the mastoiditis proper any factor that reduces freedom of egress to the tympanic fluids greatly increases its certainty of occurrence. Swelling of the mucosa in the tympanum in acute conditions, or fibrous adhesions in the older ones, may prevent egress of the discharge from the attic or so restrict the passage that only the fluid content passes, leaving cells and other detritus to make up a cholesteatomatous mass. Presupposing a tympanitis, if all the tympanic emana-

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tion has immediate and adequate outlet by the Eustachian route or by a free opening in the drum, then mastoiditis may not occur. Supposing the same conditions, if a blast of air be sent through the Eustachian tube by inadvised purposed inflation or by reason of forcible attempt at nasal breathing or expulsion, or sneezing or coughing with mouth closed, then, in spite of such desirable conditions in the presumption, infectious material is forced through the aditus to the antrum and cells, and inflammation there at once assured. Or with those conditions again presumed, with discharges coming away through the external canal, then excessive efforts at clearing same by repeated or irritating irrigations or repeated swabbing, perhaps lacking in gentleness, there occur waterlogging, edema, inflammation or furunculosis of the walls, and, egress thus stopped, a backing up of the infecting discharge into the mastoid cavity must necessarily result in that dread affection. Or again, there is a monobacterial mild infection of the tympanum; with perforation there is added another form or more, making it polybacterial, virulent and progressive, and then mastoiditis is started or revived. Also, according to Neuman and Ruttin, there may be a polybacterial infection with a mutual inhibition of the germ-content and a condition of mild inflammation, which is disturbed by the destruction of one direct or the addition of another or others—as, for instance, bacillus pyocyaneus added to staphylococci and streptococci mutually inhibitant content, through the resulting acidity, destroys the staphylococci, removes restraint from the streptococci, and increased virulence becomes at once apparent.

In the beginning mastoiditis is an inflammation of the mucous membrane lining the mastoid antrum and cells and usually is an acute process. It may, however, be chronic from its onset when coming from a chronic tympanitis and, whatever its inception, may be continued, remittent or intermittent in its type. The extent is, of course, as great as the variety of mastoid cells to be found from minute channels to separate cavities, in some instances in size resembling a peanut. The development of osteitis may cause a breaking down of any or all of the cell walls, sometimes showing at operation one large cavity. Periosteal inflammation involving its outer walls may cause perforations in the several directions: inwards, upwards, or backwards to the cranial cavity, outward to produce a frank periosteal abscess, downward to present the Bezold appearance, or forwards into the external auditory canal. Thus it may be an open or closed abscess. Necrosis may result in sequestra or fistulous tracts leading extracranially or intracranially, and sometimes communicating with the labyrinth or exposing portions of the facial nerve. Extension from it may also come by way of metastasis or toxemia. Thus are added complications of its own, including sigmoid sinus thrombosis and phlebitis which, according to Alexander, arise in this way, and from this source in 98 per cent.

of all cases inflammations and abscesses of the brain and adnexa, labyrinthitis and profound septicemia, sapremia and toxemia. In long continued cases in patients otherwise healthy, sclerosis may so thicken and densify the walls that the whole cavity becomes obliterated. For the sufferers who have also other invalidating ills, however, no such good fortune can occur, for with them the body resources are exhausted beyond power of such sclerotic process. Acute and subacute mastoiditis is nearly always quite painful, though the chronic form may give but little disturbance on this score except at the time of exacerbation. Rarely is the pain confined to the immediate region, being more likely to be of the radiating type over the side of the head, in the occiput, and may be complained of as frontal. But few cases do not have acute tenderness over the antrum, a smaller percentage over the tip of the process, and in still others this extends forward in the zygoma well in front of the auricle. Swelling and edema are more or less marked in all acute cases and less often in exacerbations with external ear displaced outwards, downwards, and forwards. Discoloration, usually present, may be very marked. Temperature ranges between 99° and 102° F., and, if found much in excess of this, one should suspect other involvement. Tympanitis circumscribed is not a febrile condition. These conditions obtain with some uniformity, together with associated otorrhea in acute states; but none of them may be present in the chronic type even in cases on the very brink of profound pathological changes. Sclerosis may have so thickened the outer wall that pressure has no painful effect on the mastoid content, and communication through the attic is closed off; pathology so surrounded begets no response from the systemic powers in fever, pain, quickened circulation, leucocytosis, and other symptoms and signs once looked upon more as the evidence of disease than now when we interpret them as the awakening of powers of bodily resistance and in a measure as harbingers of success in combating pathological processes. There will be the history of these cases to guide us: the previous discharge which has ceased without the improvement in general health and bodily vigor that should follow, the continued dullness in childhood, and mental and physical apathy to be elicited at later periods of life, the reduced hearing which should be carefully tested, and likely other conditions of spontaneous nystagmus, giddiness, dizziness, peculiarities in action or emotion, or some of the signs of beginning disturbance in brain motor tracts associated with the senses.

Rather sudden cessation of discharge both in acute and chronic cases is good and sufficient ground for suspicion, and when not associated with corresponding improvement in other phases is cause for genuine alarm. Likewise, in cases having much pain evidencing pressure from pent-up discharge, sudden relief from the symptom may only presage that room has been obtained by the

invasion of other and more vital structures. An acute suppurative mastoiditis that runs a very brief course of three or four or ten days, apparently recovering so soon, is likely to be one of streptococcus mucosus infection; and, from any unwarranted feeling of security, both patient and attendant are to be roused three or four or six weeks later by a fulminative type of mastoiditis that attacks the very citadel of life with almost explosive force.

One particular point in examining the acute and subacute cases deserves more than passing mention—namely, that the innermost portion of the external auditory canal at its posterosuperior quadrant forms a part of the antral wall, and if inspection shows a bulging over this area, delay of operation is at best only waste of time, for mastoiditis of operative type is present, and postponement only jeopardizes that patient's hearing and to a lesser extent his life. Outside the very grave physical signs indicating encephalic invasion, this is the most important indication for early operation in acute cases and is always reliable. It should not be mistaken for furuncle, or vice versa, because that condition can occur only in the outer membranous portion of the canal to which the glands are limited.

The position and character of the drum perforation may point the diagnosis of mastoiditis, for if it be high up and posteriorly located the focus of disease is surely in the attic and has been under such retention and pressure in this location that the mastoid region can hardly have escaped involvement.

With pain, swelling, tenderness and other phenomena, outside of other indisputable evidence of mastoiditis, the enlargement of mastoid glands points to some other affection, as erysipelas with its glazed redness of purplish cast and line of demarcation and high temperature, or furunculosis frequently much more painful than mastoiditis and which likewise causes displacement of the auricle outward but also upward instead of downward, and its pressure pain is limited to the auricle, mostly over the tragus and none over the antrum, which should be palpated always to the absolute exclusion of auricular movement. Not often in our own country, except in certain districts of our large cities with much foreign population, but frequently in the clinics of Europe, are we called upon to differentiate auricular symptoms and signs from the infections gaining entrance by reason of pediculosis. The enlarged glands here also not infrequently make the differential diagnosis apparent at a glance.

Transillumination, especially in the young and in acute cases, may set the diagnosis of suppurative mastoiditis or its absence beyond doubt. This may be made by placing the light on the mastoid process and inspecting the posterior wall of the external canal through a speculum in a dark room. Or a Mosher light-carrying speculum may transfuse the light from within outwards, or any small cold incandescent, such as the author uses by employing a Holmes nasopharyngoscope through an ordinary speculum, may answer the

purpose. The two ears should be compared, especially if fortunately one be healthy. Sclerotic cases are confusing in this method as also with radiograms, consistently advocated by Ballenger and Beck, in the interpretation of which much skill and long experience are necessary for approximate reliability.

Bacteremia may be a means of settling our diagnosis if other like producing conditions can be excluded. The blood-count also has the same limitation, but is considered by McKernon and Sondern and other painstaking observers as the superior method. Urbantschitsch lays some stress on blood coagulability as a means of differential diagnosis.

What is the prognosis of mastoiditis? That depends upon so many factors that even to name them all would occupy more space and time than we have at disposal.

When there is free egress for the discharge and no complications, the apparent prognosis for life is good for the time being only, for tomorrow drainage may be denied by conditions incident to congestion, hyperplasia, or other metabolic process of nature intended for restriction and protection of the general system; and again, while no signs of complication have yet reached a state of detection, already metastasis is slowly encamping an army within the citadel, or somewhere within the confines beyond our inspection, a minute point of periostitis has already robbed vitality from the inner cranial plate, laid the foundation for abscesses that sooner or later unoperated will cause death possibly preceded by worse in the form of paralysis or dethronement of reason.

This is not to say that a very large percentage of cases of simple acute mastoiditis does not recover with good management and some with no management at all. For chronic cases, under the same conditions, the percentage of recoveries is much smaller, perhaps in many cases because the chronicity itself is an evidence that a complication of retarded drainage, osteitis, or even a peculiarity of anatomical contour has obtained and will continue.

The outlook for the young is not so good, but after the age of forty it is much better. It is to be remembered that before the sixth year the different parts of the temporal bone are yet ununited and that the succulent cartilaginous binders are more easily invaded and penetrated by the pathology here flourishing. In the same way, to an extent modified by the degree and nature of the affliction, reduced bodily vigor and resistance militate against recovery. To offset this there is that yet inscrutable and immeasurable immunity of tissues at times to invasion by this, that, or other micro-organism.

It was mentioned before that in good bodily vigor sclerosis may obliterate all the mastoid cells and thus as effectually as the chisel, gouge, curette and burr preclude the possibility of continued mastoiditis. Knowledge of the bacterial content does not offer as reliable means of prognosis as was formerly hoped for, reasons to

be inferred from the section on pathology. In prognosing mastoiditis with complications of its own, of course they must be given weight according to their nature.

The prognosis as to hearing is different, and really this is the point of fine art in the management of mastoiditis and the solution of its problems. As between life and death or health and invalidism in a majority of cases, the intelligent patient and his friends may see the signs of parting ways, but they cannot see nor understand that 'a running ear,' which seems to them of much less trouble than a common cold, means in a large majority of cases ultimate destruction of the hearing power or at least its reduction beyond the stage of usefulness.

Our institutions for the deaf are filled with children whose defect has come from otitis media, and of such severe cases about 100 per cent. had mastoiditis as the most important factor in the ultimate result. For those of the past there was far more excuse than obtains now or can ever be again, for we know and should be alive to the fact that a discharging ear, a mastoiditis, is a condition that if continued means, as the smallest toll, reduction of the power of hearing and may mean death itself.

Life insurance companies will no more accept a risk with mastoiditis or discharging ear than they will one with appendicitis or Bright's disease or typhoid.

The treatment of mastoiditis is prophylactic, conservative, or more properly termed, ameliorative, and operative. It might all properly be called conservative, as its prime end should be conservation of hearing and thus come under the same heading.

First let us see to it that patients coming under our care with those predisposing factors given in the etiology are relieved of all obstructions, either congenital, developmental, or traumatic in the nose and throat. In the light of exhaustive research, it is worse than folly, and inexcusable on the part of us as educated advisors, even to acquiesce in such statements as that adenoids or degenerate tonsils will be 'outgrown' or that obstructive cartilaginous or bony spurs on walls, floor or roof of nose, or deflected septums, are not conditions for very serious consideration which sprays, douches and powders either with or without cocaine *ad libitum* will in any wise cure or even favorably modify in any really significant way. Suppuration anywhere in these regions is a positive menace among other things to the mastoid sinus and the hearing, and should be sought and eradicated just as surely and not less promptly than in the appendiceal or other important locations.

Prompt free incision of the drum in acute otitis, before the formation of pus, may prevent involvement of these cells; or arriving on the scene too late for this, freely enlarging a small perforation or extending one to the floor of the external canal may so improve the

drainage that the chain of continuation will be cut like a Gordian knot.

We should unquestionably recommend every case of discharging ear to accept treatment. In the conduct of cases, one should assiduously instruct the patients and caretakers how to avoid incidents and accidents attendant upon lack of cleanliness and improper methods in coughing, sneezing, clearing the nose and like simple but important phenomena. The happy result of several weeks assiduous care may be blighted by an unfortunate blast of air carrying reinfection through the tube to an almost healed otitis media.

In ameliorative treatment asepsis is the *sine qua non*. Of what value can it be to clear of discharge the deeper external canal while carrying by swab or washing in infection from the concha? Irrigations with the mildest antiseptics may be rarely needed, but it is a method not much to be recommended. The cleansing is better done with alcohol or benzine. Dressing with a single strip of gauze best meets all requirements.

Powders are practically no more used. They do not penetrate the crevices where they might be most needed and by caking retard drainage. Silver nitrate or copper sulphate to destroy granulative polypi or the cautious use of curette and snare, all followed by alcohol instillations, comprise the best and practically all short of operation that should be attempted for them. In acute cases of mastoiditis ice bags, or in the very young or aged, hot applications, wet or dry, relieve pain and promote reparative processes. With much congestion, especially in the full-blooded, leeches, natural or artificial, provide for increased circulation and leucocytosis. Quietude is imperative and general means looking to all emunctories should not be overlooked. Pain may be controlled with the salicylates, bromides and, if need be, codeine.

Subacute cases are sometimes modified by Credé's ointment or mercurial emplastra, and the leucodescent lamp has some advocates.

The ultimate resort, which should with greater frequency be the first when the patient is seen, is operation. Observation and intimate study of increasing numbers of these cases serve to convince, it seems, almost in direct ratio, progressive men the world over of the futility and danger of waiting, Micawber like, in the presence of important phases mentioned in pathology. A case of acute mastoiditis, or more peremptorily an exacerbation of a chronic one that shows antral bulging, periostitis, or the characteristic signs of the presence or approach of labyrinthine or intracranial complication, demands prompt mastoidectomy in a language that one should study to understand and prepare to heed or have heeded. But these are cases, as mentioned under prognosis, not so likely to suffer from lack of conception or neglect as the ones that pine in nurseries or in idleness, or stalk about our highways with chronic destructive, and yet perhaps painless, otorrhea depending upon mastoiditis, or per-

haps some other equally pernicious pathological activity which ameliorative treatment has failed, or could but fail, to relieve, having their hearing destroyed, and forfeiting their value as individuals, members of families and the body politic.

It would lead us too far afield, indeed, to take up and discuss what operation to make, whether simple, meatomastoid, or radical, or their technique. Two indications cover: All diseased tissues that are not clearly reclaimable must be removed; all structures not to be removed must not be disturbed.

Neither physician nor layman will drive a horse with 'a running ear' or tolerate a dog with mangy otitis without attempting daily to do or have something done for it; and yet our children run the streets, attend school and take up life's vocations in thousands of cases throughout the land without any or but perfunctory, unintelligent and unencouraged attempts at relief from mastoiditis and its complications. Even if our age must measure by money value, such speculation is reckless, senseless and inexcusable.

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PYELOGRAPHY IN RENAL DIAGNOSIS.

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AND
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Pyelography is a graphic demonstration of the size, form and position of the pelvis of the kidney obtained by radiography after the injection of a shadow-producing fluid. By recent advances in *x-ray* technique it is usually possible to know the external size and form of the kidney; by the aid of the shadowgraph catheter one can demonstrate the general course of the ureter and its relation to other bodies visible in *x-ray* plates; but it often remains for pyelography to give the important clue to the diagnosis by showing dilatations or distortions within the kidney itself. Of no less importance is the localization of previously demonstrated stones as to their position in relation to one or another portion of the kidney's pelvis.

Since the technical success of this method depends upon a careful and thorough filling of the kidney pelvis and its calyces with a shadow-producing material and this followed immediately by a set of carefully exposed radiographs, the necessity for a hearty co-operation between the urologist and radiologist is obvious. The injection is made with *x-ray* plates and apparatus in working position so that when filling is complete the exposures can be made at once. By using shadowgraph catheters for the injection, the resultant plates give a complete map of the interior of the upper urinary tract.

Injection.—Various drugs have been recommended for this work, among which are cargentos, collargol, argyrol and electrargol. In our work the cargentos has given the most satisfactory results and is used as a routine in 25 per cent. solution. This strength of solution has resulted in radiographs of such superior quality that the weaker solutions formerly employed have been discontinued. In this strength cargentos makes a perfect solution, whereas collargol as generally employed is merely a suspension containing fine particles of colloidal silver, which have been found upon microscopic examination to have remained in the substance of the kidney in several reported cases where subsequent removals were necessary.

The patient is prepared as for the usual cystoscopic examination, the ureters catheterized with shadowgraph catheters, and before injection a simple *x-ray* plate is made if this has not been done previously. Cargentos is allowed to flow into the kidney pelvis up

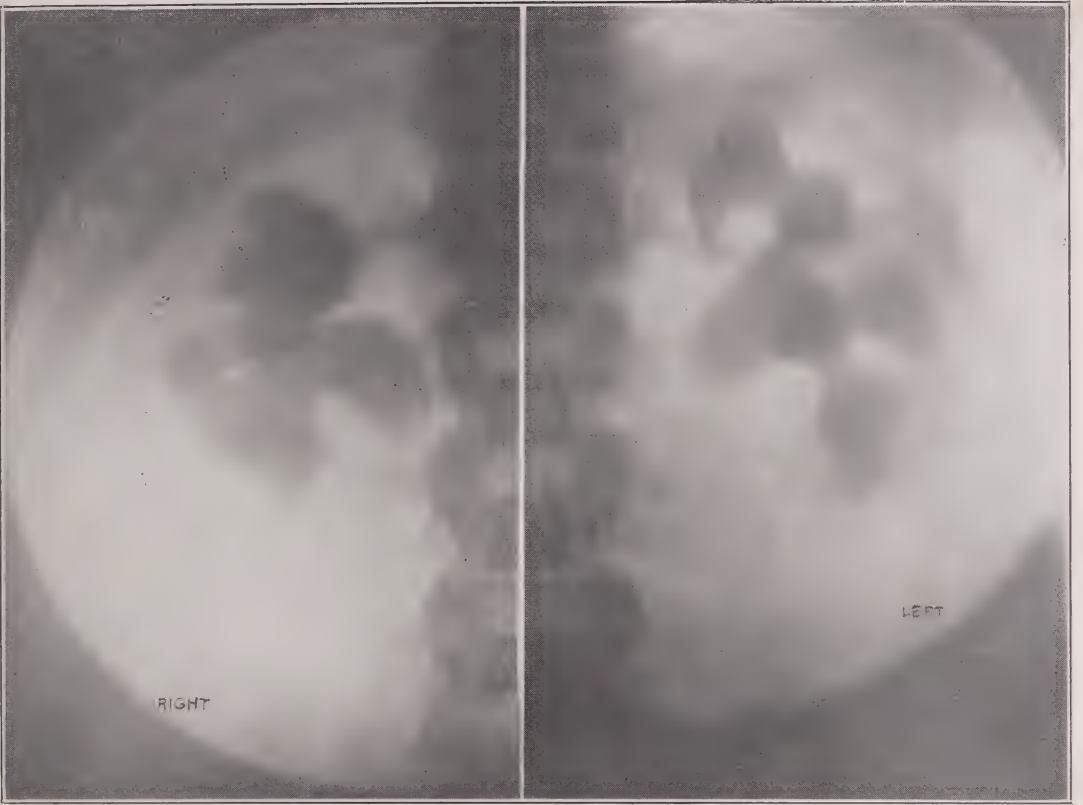


Fig. 1.



Fig. 2.



Fig. 3.

to the point where the patient experiences a feeling of discomfort. Great care must be exercised not to overdistend the pelvis, since even a moderate overdistention has been known to produce severe pain, nausea and vomiting, elevation of temperature and even rupture of the kidney. This overdistention is obviated by using the gravity method as recommended by Braasch. The occasional unfavorable results should not condemn the method of pyelography, since they are too often due to errors in technique, such as too rapid injection, forcible dilatation, or to the injection of large hydro-nephrotic sacs.

Care should be exercised in selecting the cases. For example, if a patient's general condition is such as to contraindicate cystoscopy either because of organic disease elsewhere or because of his inability to withstand the ordinary shock of instrumentation, it would be undesirable to subject him to pyelography.

As with other methods of diagnosis, pyelography too has its limitations. Mechanical factors may intervene which prevent a filling of the pelvis, such as impassable stricture of the ureter, compression of the ureter by adjacent structures, or tumors of the kidney itself which have so encroached upon the pelvis that distention is impossible.

Radiography.—The radiographic procedures should be carried out as soon as the injection is completed. Two or three exposures should be made each of short duration, since any respiratory movements of the patient move the kidney and blur the shadows. Large generators, rapid plates and intensifying screens all contribute toward exposures of minimum duration. With modern equipment there is no trouble in getting fully timed plates on heavy subjects during a slight pause in respiration. The technique, in general, is much the same as used in the radiography for urinary calculi.

Interpretation of Results.—By the amount of fluid injected one can know approximately, even before the plates are made, the capacity of the kidney pelvis on either side. The first glance at the pyelograms shows by the presence of crisp hard outlines of the carentos that the pelvis of the kidney has been completely filled. Continuous with the shadow of the pelvis and running along the shadowgraph catheter is usually seen the course and outline of the ureter due to the carentos which has filled it from above. In palpable abdominal masses of obscure nature one can orient the outlines in the pyelogram with the clinical topography and decide whether the mass is of renal or extrarenal structure.

Of particular interest are the anomalies of the kidney or ureter occasionally brought to light by this method: The horseshoe kidney, the double ureter, the kidney far out of its usual position are sometimes unexpectedly portrayed. The true pelvic kidney, aside

from occupying a position low in the abdomen, must be shown to possess a congenitally short ureter.

Pyelography in hydronephrotic kidneys is most interesting. The large amount of fluid required for injection and the large and dilated shadows of the pelvis and calyces may give the only clue to the diagnosis. Slight right-sided dilatations of the pelvis and ureter are often seen associated with regional inflammatory conditions such as appendicitis. Distortions and filling-defects in the shadows of the injected renal pelvis are usually suggestive of renal tumors.

As illustrations of the value of pyelography in the diagnosis of certain obscure renal cases the following cases may be briefly mentioned.

CASE I.—Rev. J., *æt.* thirty-six. First bladder disturbances began twelve years ago and consisted of frequency, burning and smarting on urination. He has had more or less frequency ever since. Four or five years ago began to have pains in the region of both kidneys. Attacks of pain were associated with nausea and vomiting, which relieved the pain. Two years ago the attacks became more severe so that he was only able to obtain relief by the use of morphine. The pain usually started over both kidneys, more frequently on the right side and radiated toward the front. Occasionally the pain radiates along the ureter.

At the present time there is no marked frequency of urination. Bowels always constipated. Urinary examination: turbid, acid, albumin 0, few pus cells and colon bacilli. Physical examination negative except for tenderness in the right and left quadrants of the abdomen. Cystoscopy: bladder negative as to stone, tumor or ulcer. Double ureteral catheterization. No obstruction to catheter on either side.

Pyelography shows a moderate degree of dilatation of the kidney pelvis on both sides. Kidney outlines, visible in the plates, show moderate enlargement of kidneys externally (Fig. 1).

Conclusion: Bilateral hydronephrosis.

CASE II.—Miss K., *æt.* twenty. Chief complaint, pain in the region of the left kidney; periodic and very severe in type; the attacks of pain are sudden in their onset, they last several hours, and recur at frequent intervals. The attacks are not influenced by sedatives, and morphine injections give no relief. The attacks of pain are usually followed by nausea and vomiting the next day. In view of the fact that the pain is so excruciating and that the morphine does not give her relief, it has been necessary to administer chloroform. After the patient has been completely anesthetized she usually wakes up free from pain. During the past eight or ten weeks she has been anesthetized with chloroform four or five times for relief of the pain. If the anesthesia is light, the pain is usually not relieved upon awakening.

General physical examination is negative. Urinary examination, negative. X-ray negative. Cystoscopy and ureteral catheterization negative.

Pyelography with shadowgraph catheters shows the following: The external outlines of the kidneys show them to be small, high in position and lying unusually close to the spinal column. The shadow of each pelvis and its calyces is inverted, the calyces projecting toward the spine rather than away from it (Fig. 2).

Conclusion: Kidney small in size and anomalous in position. They have rotated on their long axis from a quarter to a half of a circle. If there is a horseshoe connection between them it is not completely demonstrated.

CASE III.—Mrs. A. L. S., *æt.* thirty-two. Patient has had ache on the left

side ever since she can remember. During the past year pain in the left side has become worse. Three years ago was treated for a long time for an attack of 'indigestion.' During this attack of indigestion, she had burning and frequency of urination. One year ago, at which time the patient was pregnant, albumin was found in her urine. During this time she had a profuse hemorrhage in the urinary tract. At eight months she aborted and the hematuria stopped at once.

Her chief complaint at the present time is burning on urination and pain in the left side. General physical examination negative. Left kidney is enlarged and easily palpable. The lower pole of the right kidney can be felt. Cystoscopy negative. From the right ureter clear urine was obtained; left ureter urine contained pus and colon bacilli. The x-ray picture showed stone in the left kidney. Patient was operated upon and stone removed. Patient again complains of pain in the left kidney, and there is pus in the urine.

Pyelography shows the right kidney to be about 3 in. lower than the left, which is in normal position. The pelvis of both kidneys is greatly dilated, especially the left, which by itself is the size of an ordinary kidney. The external boundaries of the kidney are not proportionally increased, the *carpentos* shadow nearly reaching the external cortical margin.

Conclusion: Ptosis of the right kidney. Bilateral hydronephrosis, most noticeable on the left. Cortical substance of left kidney greatly thinned.

NOTES ON EUGENICS.

By B. S. TALMEY, M. D., of New York.

(CONCLUSION.)

Among the means of prevention of propagation, the segregation of the defectives in different homes (such as asylums for epileptics, for feeble-minded or for deaf-mutes) would be the most humane method, but also the most unsafe (temporary escape is never impossible) and the most burdensome for society. To segregate people who are still able to support themselves and deprive society of their earning capacity represents a great economic loss to the body politic.

The other quite humane method of prevention of propagation is simple sterilization. The slight operation of vasectomy, respectively salpingectomy does not give the least inconvenience nor does it alter in the least the mental or bodily character of the operated individual. For this small operation has no more effect upon the person than an obliteration of the vas deferens in the male or of the Fallopian tube in the female; and these obliterations cause so little inconvenience that they remain, as a rule, unknown to the man or woman. They are only accidentally discovered when the patients apply for the treatment of their sterility.

Hence all intelligent people who have some minor hereditary taint should be taught to renounce propagation by this method. Those with a neuropathic diathesis or with an alcoholic diathesis, or who show an inability to learn in school, or those in whose families are found cases of dementia præcox, maniac-depressive insanity, or those suffering from incurable inheritable diseases such as tuberculosis, cancer, syphilis, hemophilia, color blindness, albinism, in short of such diseases that do not impair their judgment, ought to preclude themselves from parenthood by voluntarily submitting to this operation before marriage.

Those, whose judgment is materially impaired to realize the seriousness of their propagation, such as the incurable insane, the inherent epileptics, the born deaf-mutes, the idiots, imbeciles, and feeble-minded, should forcibly undergo this operation. Even the dull and idle should be deprived of the chance of propagating their kind by means of sterilization. These incompetents and degenerates furnish the material from which the ranks of the habitual criminals are recruited. Since we have learned that the great horde of defectives is due to unfit matings and that indolent strains arise by the mating of indolent persons, society has a right and even a

duty to weed out these delinquent, defective and dependent classes by the prevention of the procreation of the various defective offspring.

The third method of preventing propagation is castration. Sterilization does not deprive the individual of his desire for the sex act nor of the ability to perform the same, or of the faculty of experiencing libido. Hence the murderous and erotically degenerated criminal classes will remain a menace to society until they are deprived not only of the potency of procreation but also of the potency of copulation and of experiencing libido. The method of castration, therefore, should be reserved as a penalty for the outspoken habitual brutal criminal, the rapist, the confirmed inebriate, the incorrigible burglar or gunman, the gibbering idiot, or imbecile cretin with the inherited tendency to crime, and the unstable erotopath. The offspring of this class are predestined to be degenerates and one of the two operations is imperatively indicated. In the interest of the patients themselves the more radical is to be recommended. Just as gelding of the bull and stallion changes the vigorous, powerful, spirited animals into the comparatively quiet, docile ox and horse, so may the unsexing or castration of the unfit have a beneficial quieting effect upon the ferocious, currish, stupid human semi-animal.

No doubt castration is a pretty severe penalty for any human being. But degeneracy itself is the penalty for the violation of biological laws, and the eradication of degeneracy is no more than the satisfaction of the law of talion and the restoration of the moral equilibrium. Society has a right to make use of these measures of defense to free itself of the degenerates, and nothing short than depriving them of the capability of procreation will do the work.

The defectives, when at large, will always find mating facilities even with the healthy, and thereby dreg fresh blood into the vortex of disease. The progeny of defective parentage are always defective. Two imbecile parents will never produce a perfectly normal child. A superior mated with an inferior may sometimes reproduce the normal, but, as a rule, the progeny of this crossing will also be defective. The eradication of every kind of degeneracy is hence the solemn duty of society to relieve the burden of the community, and by the reduction of the lower types in each successive generation, degeneracy could be weeded out of human society.

When all undesirables have been eliminated, one way or other, the fall of the birth-rate could rather be welcomed. The check of population may become ruinous to a state when threatened by a more populous neighboring state, but to human society at large this check is of great benefit. It is not quantity but quality of life that gives survival value and dominance. It is the custom of superficial thinkers to deplore the control of population. But people who regard the falling birth-rate as in itself a sign of social degeneration,

in spite of Spencer's law of "antagonism between individuation and genesis," have not learned as yet the first principles of eugenics.

The falling birth-rate in communities on the height of civilization shows rather that even the laboring class, which composes the bulk in every population, is beginning to practise the suppression of quantity by quality. Hitherto the chief reason for the laboring and farming classes for bringing a large quantity of children into the world was their economic value. These classes are now learning that a smaller quantity of superior quality is of greater economic value than a large quantity of inferior quality. If one-third of all babies born will be dead within five years, then it would be of greater benefit to society to prevent this one-third from being born, and thus save the mother's health and in a certain respect enhance her economic value. Moreover, the birth and death of a child, apart from the mental suffering of the entire family, is from the purely economic point of view a great waste to the family and indirectly to the community. The demand for quantity of offspring regardless of quality and survival value is hence not only anti-eugenic but against the best interests of political economy.

The other method of the realization of a superior humanity is the positive breeding of superior offspring. This method is seriously advocated by eugenists, such as Ehrenfels, Hallmeyer, the Mittgart society, etc. In the proposals of the advocates of the method of the stock-farm we see how a noble movement, such as eugenics, will produce its excrescences. The different proposals of all these reformers amount to the same thing—the establishment of a veritable polygyny.

The polygynic mode of pairing is claimed to be intended by nature, since one man can impregnate innumerable women. The superior man may thus be allotted a certain number of superior women as wives, while the men less endowed with physical and mental attainments will have to remain unmated. In this way only men and women possessed of the highest physical and mental qualities would be cultivated. Polygyny would thus improve the race in the highest degree.

In accordance with this theory, Ehrenfels proposes the establishment of different mother-homes of superior women. The superior man marries one woman of such a home, without taking up a common domicile with her. She remains in the home. The family, in the present sense, is abolished. The same man is not allowed to marry more than one woman in the same home, but he may marry several women in the different homes.

The Mittgart society would establish a division of labor, as found among the social insects. One group of superior men and women should take care of the propagation of the race, the other part of humanity should remain in the service of civilization and culture.

Only individuals with more than the average of physical, mental and moral qualities would be allowed to mate. Fathers and mothers are chosen by the state for their good qualities. Favorable inborn transmissible characters, such as stature, strength, good digestion, musical sense, exceptional intelligence, sympathetic temperament, etc. would be transmitted by the mating group, while advantageous acquirements, such as industry, knowledge, culture, accomplishments which die with their maker would place the possessors into the working class.

The other proposals of the production of a race of thoroughbreds are of a similar nature. They all advocate laws and regulations that only the superior members of the community should be allowed to breed and the procreation of the inferiors should be restricted by the police. Such an arrangement it is claimed will lead to the production of a race of people which would put the Spartans to shame. The proposed arrangements would tend to abolish everything but the physical aspect of fatherhood and, in a certain respect, also of motherhood. The children would be brought up in state institutions; they would be the children of the state.

All the proposals are so phantastic that they would not deserve of any serious consideration if they emanated from the pen of some irresponsible dreamers. But when university professors and doctors, in whose hands the shaping of the entire mental make-up of the youth of one of the world's foremost countries, join in advocating such singular vagaries, it is the duty of the writer on eugenics to submit even the vagaries of such men to a closer examination. The avowed aim of the advocated change in the marriage relations is the breeding of superior children. But will the state's children grow up to be superior men and women?

Such children will no doubt show a superior physique, but will they grow up to be also men and women of superior mind? In the selection of mates the physical factors, such as stature, beauty, strength and health, play and will always play the most important rôle. Physical qualities are easily rated, but there is not in existence a dynamometer of intellect.

Yet the supreme survival value for man is his intelligence. Man has staked his all upon mind. Artificial breeding may be applied to almost every living being, because these creatures are mostly bred for their physical qualities. It can also be applied to man in the propagation of a human stock of better physique. But a better physique does not mean a superior mind. The possessors of artistic or literary composition, of mechanical skill, of calculating ability, of energy and of general mental ability, all qualities transmissible by descent, are seldom or never endowed at the same time with physical qualities. Still the mental qualities are of the greatest survival value in man. It was brain not brawn that saved man in his struggle for existence. The cult of the muscle as against in-

telligence would destroy man. Even the animals in their natural surroundings live by their wits rather than by force of bone and muscle; and it was man's wits and will that enabled him to increase and multiply as no other animal. Physical weapons of defense and offense have disappeared in man because his intelligence makes them superfluous. In the human species mind is master of matter. This emergence and dominance of mind have enabled the human species to ascend through struggle and internecine war, although it is physically one of the feeblest among the species of the higher animals. The increasing dominance of mind over matter was the cause that nowadays mental qualities dominate all else in man's living activities.

Now, the overthrowing of all human institutions and the imitation of the method of the stud-farm, as advocated by the modern race-culturists, can only be productive of a better physique but seldom of a higher intelligence, ability and character. The physically fittest is not always the best of men. Certain valuable members of society fall short in physical survival value. On the other hand, physical defects have not been detrimental to intellectual welfare. Mozart suffered from vertigo, Beethoven from asthma, Molière from hemorrhages, Descartes from fainting spells, and Byron, Cæsar and Napoleon from epilepsy. William of Orange was always weak and puny, Calvin was infirm, and Ruskin was always in feeble health. Newton, the discoverer of calculus and the laws of gravitation and of motion, was a seven months' weak baby and would have been destroyed in Sparta. Mendelsohn was hunch-backed, Spinoza tuberculous, Heine tabetic, Homer and Milton blind, and last but not least Emperor William II, one of the greatest monarchs Germany ever had, is suffering from a paralyzed arm. The mental elite are often lacking of a good physique, and the physical elite are seldom the mental elite. Sparta shows what may become of a nation by its worship of the physical virtues against the moral, artistic and intellectual virtues.

Now, while it is possible to breed for body, it is impossible to breed for brain. We can seldom predict the mentally fittest or unfittest. We cannot produce geniuses at will. If we mate two geniuses, the chances are that the offspring will not be a genius but an abnormal hysteric. But even if there were reliable guides in parenthood, would the abolition of the family, as proposed by the race culturists, lift the race to a higher level of existence? Will the selection of parentage be an effective process for the continual progress of humanity? Will it produce strong individualities? In the production of physical strength the germinal qualities alone are of decisive importance, but intelligence needs nurture and guidance besides the highest germinal qualities, and the best guides for the child are the parents, father and mother. The father, no less than the mother, is of the highest importance. Fatherhood played a great part in

man's progressive evolution. Moreover, the abolition of the family, as proposed by the modern radicals would also destroy the influence of motherhood, which cannot be superseded by any other person. There is no counterfeiting or replacing the psychical component of complete maternity. Children were not meant to grow up in institutions, but in homes near their fathers and mothers. The superman will not be evolved by the abolition of motherhood or fatherhood. The cardinal requisite for a proper guardian of childhood is love of children, and this love cannot be hired from the foster-parent in institutions. Only those individuals love the children best and are ready to sacrifice their very lives for them who have given life to those children.

Even the men and women who are vieing with one another in studying children, working with them, and writing and speaking in behalf of them, are not always really loving them. When these people marry they seldom have children of their own. They possess little parental interest for children. Their parental interest has turned into the scientific. Their philanthropic interest betrays the decay of their parental affection, and without parental love no philanthropist can offer to the individual child the proper euthenics. The greatest philanthropist will always remain a stranger to the child's inner nature. The physical and mental side of education may be imparted in institutions among strangers, but the spiritual and emotional education of the child, the awakening of its higher sentiments can only be carried out in the atmosphere of love and affection in the parental home.

Eugenics without euthenics cannot produce an ideal humanity, while in the proper surroundings in which individualism is allowed full play, as in the family, racial improvement is not impossible, even in moderate eugenic families. Most children are physically fit at birth, and provided there is no actual mental taint and they are allowed to be individually trained by their parents, they will grow up to be desirable members of the human society. Although every child must begin anew as his parents, still civilized humanity has the advantages of traditional knowledge. By the transmission of parental requirements through speech and writing a large number of children may be enabled rapidly to reach a higher standard of mental development. By means of the written word and of the press, the parents can teach their children what they have learned, and the children may begin where the parents left off.

The best place for raising superior children is the family. The family is also of the greatest importance for the welfare of cultured humanity. The ideal of the family, says Eliot, is the most fertile in every sense of the sacred thought of the human species. It is fertile of the consecration of human affections. It is fertile of good, it is fertile of permanence in human society. The destruction of the family would lead to the destruction of warm feelings, the moral

nature of man. The biological marriage (the conventional or legal marriage is not always biological) is a natural phenomenon, and not a human invention, as some radicals claim. Free sexual relations without matrimonial bonds, as advocated by modern radicals, would deprive man of the richness and fulness of life.

Even to the man who regularly indulges in meretricious venery there comes a time when these bonds of mere passion do not satisfy any longer. He begins to crave for a permanent mate and a home. When the modern man marries he desires, as a rule, the woman's spiritual companionship. Woman's physical attachment he could find in meretricious venery without the marriage responsibility. Permanent mating or marriage is, therefore, a spiritual necessity for man, and among all the forms of marriage, monogamy is the best that has been devised for the contracting parties primarily concerned, for their children, for home life and for society. The monogamic family is the only place where man is able to get the most joy out of life, and the hedonic purpose of life, besides the experience of the divine urge of progress, is the immediate apparent end of life.

The destruction of the family would cause the departure of real joy from life. Hence, granted that the breeding of superior mental qualities was possible outside the monogamic family, is it desirable to breed superior men as we breed superior animals, if the superiority does not lead to a more satisfactory life? Animals are bred for a certain purpose. What is man's purpose and aim? What is meant by the fulfilment of man's destiny? The common meaningless answer we receive from the radicals, that the real aim is to be useful in real life, only begs the question. What is life, what is it here for? Whence does man come, whither is he traveling? The reading of nature fails to elucidate this point. What we find in organic nature is excessive production and wholesale destruction. The abundance of the reproductive cells in plant and animal is amazing. Every ejaculation in man contains two to three hundred million spermatozoa, each one of them sufficient for impregnation. Each ovary of the newborn baby girl contains about thirty thousand ova, each potentially a human being. The first effort of growth is to set aside a part of the germ itself for future reproduction. This germ can be indefinitely multiplied and handed down to untold generations. The reproductive cells, *i. e.*, those cells which have not lost the primary power of multiplication, are of the first consideration; the specialized cells or somatic cells, *i. e.*, those that cannot reproduce any longer are of secondary importance. Nature's sole solicitation is the race. The supreme law of organic nature is the preservation of the kind. Nature takes no chances. Her sole aim seems to be the perpetuation of the species, hence the abundance of the germ-plasm in plant and animal. Nature secures the continuance of the kind by the extravagant production of material and

the ruthless destruction of all that is superfluous. Nature has no regard for the individual. The fly is destined as a prey to the spider, the spider to the swallow, the swallow to the hawk, the hawk to the eagle, and the eagle to the hunter. But what is the hunter's destiny? Here nature is silent. The crown of creation seems to be here for no purpose. Man's life seems to have no value. The individual does not count, it is created to be destroyed. Nature is careless of the single life. The individual withers, the race is more and more. Everything that serves to improve the race seems to be in harmony with nature. But to what end is the race here? Nature in the universe owes us the answer. Only when we return to a certain part of nature, human nature, or to that part of nature which dwells in man, we find some hints for the reason of our being in the world. It is the experience of the divine urge of progress and the certainty that the crown of altruism is of the highest value in life.

In the service of others, we may choose two different ways. We have the choice between the Judeo-Christian doctrine of the protection of the weak and the brutal philosophy of Nietzsche's superman. The former proclaims the sublimity of abnegation in the interest of the present weak and downtrodden, the latter preaches the sacrifice of the present in the interest of the future generations of supermen. If we knew the highest value in life, the choice would be easy. But what is the highest value? What is the best for society? What are the greatest aims and ends in life? Are the material gains of society of supreme value? Is the building of railroads, telegraphs and telephones or factories of supreme value, or are the ends of life the writing of lyrics, painting of pictures, and the chiseling of statues? What is the aim of civilization? What will be reached with the superstate of society? If the end and purpose of human existence were known, we could decide whether it is worth while to expend human energy upon the increase of material well-being, whether it is preferable to conserve this energy for the attainment of spiritual joys, or whether the ethical efforts would be of the highest cosmic value. But the ultimate purpose being unknown, or even unknowable, what will be reached when the superman has been produced? What is he going to accomplish? What when the highest degree of accomplishment has been reached in science, art, literature and economics, what then? The different reformers claim that, following their doctrines, it will lead to the highest advantage of humanity. But they all fail to give the definition of advantage. What is the best for humanity? They all seem to assume that the best is transcendently known to every normal human being. What is it?

The best that everybody recognizes is that which ultimately contributes to his well-being. If civilization means anything it means the victory of man over nature in the interest of the welfare of the greatest number of the individual members of each generation. All

advances of humanity, the ethical, the artistic, the scientific, or the material have contributed to the enhancement of human welfare. Commerce, industry, art, and science must enhance the well-being of human society, or they are of no earthly value.

But society is only an abstraction, organized for the fulfilment of the inarticulate longings and vague aspirations for pure happiness. Society consists in the association of men for the common good of human beings in all their natural limitations. All law and custom exist to benefit the individual who is the society-unit. Culture is the pursuit of the total happiness and of the elevation of individuals. Progress means the advance towards a higher and higher level of the individual well-being. Social ends cannot be served unless they tend to the gratification of the desires for happiness and enjoyment of individuals. The perpetuity of humanity is inconceivable unless the well-being of individuals is observed.

The ultimate appraiser of all values is, therefore, the promotion of the real welfare of humanity. According to human understanding, the hedonic is the supreme test of terrestrial values. Any social arrangement, to be of any value, must bring a higher degree of real happiness to the greatest number of the individual members of society. Hence that mode of marriage must prevail as a human institution which contributes, in the highest degree, to the well-being of the greatest number of society's units. If it be strict monogamy, as seen above, then polygyny, polyandry or general promiscuity have no claim upon present human society, even if these methods of union should produce the dreamt of superman. The state of the superman is desirable only in so far as it will facilitate the pursuit of the individual well-being of the future generations. But there is no justice to serve the future of the race at the expense of the present. The members of the present human society have also a right to live and enjoy. Why always the benefit of the future; has the present no claim?

Moreover, the future would in no way benefit by the sacrifice of the present. Where there is no end there cannot be any real future. Every future improved generation will have again to sacrifice its well-being in the interest of the succeeding generation. If the science of eugenics should succeed, in one way or another, to create a race of physical, moral and intellectual giants, the success would not mean progress, if the life of these giants would be devoid of the higher spiritual and emotional joys, as found within the family.

Society itself, *i. e.*, the abstract organization, may flourish, still the members thereof may lead a sad and dreary life. A society may be very strong and still subject its members to such strict rules and regulations as to make them perfect slaves of an invisible master and render their lives utterly miserable. There seems to be a hazy idea among many reformers about a society and its composing units. Many a state, under a tyrannical despot, was strong

and flourishing, still the citizens sighed and groaned under the bondage.

The mere production of intellectual giants and the creation of the highest state of society do not always mean hedonic gain for society's units. If all men were Aristotles, Kants, or Spencers, if all women were Sapphos, Madame de Staëls or George Eliots, the fact of their intellectuality alone would not insure for them real happiness. No real benefit will accrue to a humanity of poets, artists, philosophers and scientists; no felicity, measured by human standards, will arise from the multiplication of new discoveries and inventions by the millions, if men and women, one sex separated from the other, were compelled to live herded together like soldiers in armories. Purely animal enjoyment will never satisfy man. His craving goes out for psychic joys, such as love and affection of mate and child, and these spiritual joys are only found in the monogamic family. Only in monogamic wedlock can there be any true mental and spiritual community of souls, which gives the proper value to life and offers the real hedonic satisfaction for the cravings of the human psyche.

For this reason, if for no other, polygamy, even in the countries where it was theoretically allowed, was very rarely actually met with. Throughout the entire history of the polygamous Jews only about half a dozen polygamous marriages are recorded. Among the Teutons, Tacitus found only few nobles to possess concubines besides their wives. As a matter of fact polygamy is a physical impossibility. Where no man or woman remains unmated, general polygyny or polyandry is practically impossible. The number of the two sexes is nearly equal. If infanticide is not practised (male infanticide has seldom been practised except in Egypt, Exod. I.16) and war captives or slaves are not available, the general public must be content with one mate.

The advocates of polygyny claim that under this mode of marriage there would be an excess of men over women, and the latter could exercise a stricter selection of the fathers of their children and thus produce higher civilization. Why the women will make a better selection of the fathers than the men make now of the mothers of their children, except upon the theory that the best guide in the selection of a mate is instinct, is not explained. For no one has ever claimed that women are intellectually superior to men. Moreover, polygamic nations, such as China or the Mohammedan countries, do not show the vaunted high culture. The polygamic state of Utah, with a practically homogeneous Anglo-Saxon population, has not as yet become the mother of the superman.

Civilization, on the contrary, derives greater benefit from the monogamic marriage. Where there is monogamy there are enough wives for all men. The struggle of the men for the possession of mates is removed, and many virile forces

are set free to be used in building up a higher culture. Moreover, the rivalry in the polygamic society for the possession of women would give the victory to the physically stronger; he is generally possessed of an increased sex-instinct and he will show more endurance in the struggle for the woman's possession. A high mental development, on the other hand, usually results in a certain corruption of the instinct of propagation. Hence, the superior men would seldom show the necessary endurance in the struggle for the possession of mates. They would thus remain unmated, and their mental superiority would die with them. In the monogamic society the struggle for the mate takes an entirely different aspect. The slight excess of the females creates a certain rivalry among the women for the possession of husbands, and the superior man has also a chance to secure a wife. Some woman will marry him without any effort from his side, and his superiority may thus be transmitted to his offspring. Geniuses are, therefore, more frequently met with in monogamic societies.

But the fact is that as long as marriage remains a private affair of the two contracting parties, neither monogamy nor polygamy will artificially hasten the appearance of the superman. Any sex-order for breeding purposes must be a public institution, and such an institution would be the worst slavery history has ever seen. Mardach ("The Tragedy of Man," twelfth scene) gives in his drama a true picture of the tyranny of such institutions. The hero and heroine of the tragedy are Adam and Eve who are repeatedly reincarnated at different important periods in the world's history. The last reincarnation on this earth takes place several thousand years after our present era. At the end of the twelfth scene Adam is present when the old man or judge of the town (called by those people Phalanster) disposes of children and wives. Two women, one of them the reincarnated Eve, arrive with their young children, and the judge, upon the advice of the scientist, has to decide which trade they should learn.

Judge.

Scientist! Examine the skulls of these two children.

Scientist.

This child should be brought up to be a physician, the other to be a shepherd.

Judge.

Out with them.

Eve.

Do not touch him! This is my child. Who dares to tear him away from his mother's breast?

Judge.

Take him away! Why tarry with him any longer?

Eve.

My child, my child! Did not I nourish thee with my heart-blood? Where is the power that may rend this holy bond? Shall I disclaim thee forever, that thou mayest be lost in the crowd, and my searching eye, in restless fear, shall in vain look for thee among hundred similar phalanster-types?

Adam.

O friend, if ought is sacred to you, leave the child to his poor mother.

Judge.

You play, oh stranger! a daring game. If we allowed the revival of the conquered prejudice, formerly called the family, then the acquisitions of the present science will tumble at once.

Eve.

What is to me your frozen science? May it fall, where nature's voice speaks.

Judge.

Well! will it be done soon?

(The child is carried away.)

Eve.

My child, my child!

(Eve faints.)

Second Scene.

Judge.

These two women are not paired yet. Those who wish them for pairing come forward!

Adam.

Upon this woman make I claim.

Judge.

Scientist! what is thy opinion?

Scientist.

The man sentimental, the woman nervous, an unhealthy issue would be the result. This pair fits not together.

Adam.

Still I shall not let her go, if she wishes me.

Eve.

Magnanimous man, I am thine.

Adam.

I love thee, oh woman! with the whole fervor of my heart.

Eve.

Also I, this I feel, will forever love thee.

Scientist.

Why! this is madness. Strange indeed to see reappear the spirit of bygone ages in our enlightened world. How comes this?

Adam.

It is a late ray of light from paradise.

Judge.

It is pitiable.

Adam.

Pity us not. This madness is ours. We surely envy not you for your soberness. What in the world ever was great and noble was such madness, which is not confined by circumspect anxiety. The angel's speech that sweetly sounds down to us from higher spheres is a safer proof of our soul's affinity and kinship to the higher regions. We despise the low common dust of this earth, searching boldly the road to the higher spheres.

(He holds Eve in close embrace.)

Judge.

Why listen any longer to this nonsense. Away to the hospital with both of them.

This fancy of a poet nevertheless gives a true picture of the conditions we may expect, if the sociologists of the modern radical school should succeed in establishing their sex-order. This order must logically lead to the harshest and most bewildering tyranny

mankind has ever known. Any liberty loving nation will prefer panmixia or blood-chaos, with the freedom to choose their mates by means of love or even infatuation, to the patriarchic slavery of being mated like race-horses. The brutality of Nietzsche's philosophy has never attracted normal people, even if they had the assurance that the offspring of the brutal mating will turn out to be supermen. This assurance is wanting. The lessons of history teach just the contrary. The artificial breeding of the Spartan warrior led to the sterility of every progress of culture, science, art or economics, while the chaotic panmixia of Athens did not prevent this town of only thirty thousand inhabitants, two-thirds of them slaves, to become the spiritual centre of Greece. But for Athens and its panmixia, Sparta's history would have remained unwritten and its people buried in oblivion, like many another nation that is known by name only. The most vaunted Spartan vigor has not left the least sign of a monument, chiseled, written, carved, or stained, to record Sparta's very existence. Sparta's vigor was the vigor of the bull or the elephant.

The advocates of polygamy accuse monogamy of being the cause of prostitution. But history contradicts them on every page. Since the dawn of history prostitution existed in every country, whether polygamic or monogamic. The Hammurabi codex, paragraph 100, has already rules about the Hierodules, or girls consecrated to the service of Venus. Moses, Deuteronomy XXIII, 18, commands, "There shall be no temple prostitute of the daughters of Israel." (Still prostitution existed among the Jews as seen by I. Regum XIV, 24; XV, 12; XXII, 46; II. Regum XXIII, 7; Amos II, 7; Hosea IV, 14. At this point the prophet distinguishes between the common prostitute and the temple prostitute.) Prostitution is rampant in China, Japan, and in the polygamic Mohammedan countries. Moreover, as eugenists, these reformers ought to welcome prostitution as being of the greatest eugenic import. Dr. Pauline Tarnowsky ("Etudes anthropométriques sur les voleuses et prostituée") found that "professional prostitutes are imperfect beings, affected by arrest of development, generally due to morbid heredity, and present mental and physical signs of degeneracy in accord with their imperfect evolution. They accept their abject trade agreeably and do not want to change it. Laziness and absence of moral sense are the principle traits characteristic of the prostitute." Dr. Olga Bridgman (*Journ. Amer. Med. Assoc.*, August 16th, 1913) found among 104 sexually immoral girls, examined at admission at the state training school for girls at Geneva, 101 or 97 per cent. feeble-minded and only 3 normal. *The Sanitarian* (March, 1904) claims that not 1 per cent. of prostitutes are able to read or write because they are of such a low order of intelligence that they cannot be educated. Now, Woodruff ("Expansion of Races," p. 193) estimates about one million prostitutes in the United States and Roe

(*Woman's World*, September, 1909) asserts that the average life of these girls is about five years. In other words two hundred thousand prostitutes die every year in the United States, or four thousand a week. All these girls become infected in the first few weeks after they have entered their new trade, and become sterile and useless for propagation. In this way four thousand degenerate woman are weeded out every week, which can only be a blessing to humanity in general and to womankind in particular. The elimination of such a considerable number of the least moral and least intelligent women must result, in the average, in a higher standard of morality among women.

But the fact is that neither polygamy nor polyandry or any other 'gamy' will do away with prostitution. As long as there is a supply of prostitutes there will always be a demand for these unfortunates, in polygamic or monogamic countries. The notion that it is the demand which creates the supply has been spread by superficial observers. It was not the demand for the telephone that led to its invention or the demand for railroads that led to the invention of the steam engine. As long as we allow mental defectives to propagate their kind, there will always be degenerate women who will prostitute themselves, and by this very act create a demand in any society, whether polygamous or monogamous.

Moreover, if polygamy would do away with prostitution, as it is claimed, most of the European countries ought to be free of this plague. For in practice even the most enlightened countries live a polygamous life, setting aside prostitution. Not only the men but also the women have little regard for the conventionalities in this respect. Professor Klumker (*Umshau*, No. 12, 1913) found that in the kingdom of Saxony from 1875 to 1885, 50 per cent. of all first conceptions were illegitimate. Almost two-fifths of all women who gave birth to children for the first time were unmarried and 45 per cent. of all births in wedlock were conceived before marriage. Such conditions are nothing short than polygamous. Still prostitution is flourishing in these very countries. The reason for its existence is the continual fresh supply. Only the prevention of the propagation of defectives would cut off the supply of prostitutes, drunkards and criminals.

With the gradual elimination of the undesirables, it would matter little if cultured people married late and had fewer children. We need more common people to do the labor of the world than sports or variations. Humanity would soon starve if it consisted of Apollos, Venuses and intellectual giants only. A Venus was not created to wash dishes, neither will an astronomer make a proficient bricklayer or a poet a good shoemaker, Hans Sachs to the contrary notwithstanding. The phrase that society wants nowadays not the man who is a good machine but the man who can make one, sounds pretty clever but it is not true. The truth is that for

every machine invented, we need hundreds and thousands of men to handle the same. A population consisting of superior men only, such as inventors, captains of industry, professional men, rulers, statesmen, generals, poets, artists, etc., could not exist for any length of time.

Furthermore, the common people or the poorer classes are not so poor of geniuses as the radical race-culturists seem to imagine. The higher variations are not always found among the descendants of intellectual giants. Nature, on the contrary, seems to abhor exceptions. It creates variations or sports, but these are exceptional phenomena. The progeny of the sport returns to the average of its species. This phenomenon appeared to the keen observers in the Talmud to be axiomatic. They only ask for the 'why.' "Why is the son of a scholar seldom a scholar?" (Nedarim 81a). It is true that Cimon was the son of Miltiades, Alexander the son of Philip, the mother of the Gracchi a daughter of Scipio, Mendelsohn-Bartholdy the grandson of Moses Mendelsohn, and Charles Darwin the son and grandson of two celebrated Darwins. But these are only exceptions to the rule. Higher types more often spring from mean or lower strata of society, who have bitterly to struggle for existence. "Do not neglect the children of the poor, they are the source of culture," says the Talmud (Nedarim 81a). All the great discoveries have been initiated by the chosen few from the middle or working classes. The advancement of the race depends upon the struggle for existence. Men must struggle, or they will degenerate. When the terms are too easy, down they go. Aristocracy, resting upon its laurels, which its ancestors gained in war, has seldom made any great strides in the peaceful struggle of mind against mind. Such aristocratic or, as the Aryanomaniacs are pleased to call them, superior families become extinct after a few generations. They gradually lose their survival value. The aristocrats of physique who excelled as hunters and warriors had the better opportunity of survival in primitive society. But with advance of civilization, when the power of the muscle is of secondary consideration, such aristocracy dies.

Here we have reached a point where we may direct our attentions to another vagary of the race-culturists, which may bring the admirable doctrine of eugenics into undeserved disrepute. The same reformers who would pair men like race-horses, as a rule advocate the breeding of pure Teutons, the only representative of the Aryan race. These Aryanomaniacs proclaim the doctrine that every advance in civilization started from the Aryans, and where the latter became extinct, the empires died with them.

But the extinction of empires had similar causes as the disappearance of aristocracy. Those nations who possessed greater valor, industry and, above all, a better faculty of adaptation reached a higher stage of culture. With the advance of culture there is a

mitigation of the fierce struggle for existence. The energy formerly needed for securing food and shelter and protecting life is now freed to be employed in the interest of the higher intellectual vocations, such as the creations of handicraft, art, literature, and science. In this way development progresses along the intellectual path, and the race rises to a higher standard of mentality. But physical prowess retrogrades. Hence at a time when war was mainly waged with weapons requiring great physical power, as before the invention of gun-powder, it was natural that the cultured nations could not long withstand the attacks of the primitive races who were as yet not touched by the enfeebling influences of culture.

This was what happened to cultured Greece, when attacked by the more primitive Macedonians, to Rome when it had to combat with the barbaric Teutons, and, later in history, to the Eastern Roman empire and to the Egyptians when the Turks swept over their countries. The reason of the conquest was not, as the Aryanophiles pretend, that the higher type, the Aryan, had conquered the lower, the Mediterranean type (there was more Aryan blood yet left in Constantinople and Alexandria than the Turks ever had possessed), but that where war is carried on with physical means instead of nowadays by more mental strategy, the primitive race had the advantage over the cultured race.

In the primitive race the unfit are weeded out in the fierce struggle for existence; in the cultured race the unfit are allowed to survive. The fall of Athens, Rome and Venice and the decline of other seats of culture were not due to the disappearance of the original governing class (races do not die, but civilizations and empires) but to the decrease of all fit classes and to the predominance of the unfit. It was not only the dominant class, the alleged Aryans, that was decimated by the eternal wars, but the young and vigorous men of all classes were drafted into the armies and killed off, leaving behind the weaklings. At Thermopylæ not only the three hundred celebrated Spartans, but also about a thousand anonymous perioiki left their lives.

This decimation of the strong men by the eternal wars was only a contributory cause of the decline of the ancient empires, the main cause was that the high culture had the effect of a reversed selection. Voluptuousness, and luxury and the egotistic need of personal enjoyment and pleasure led to the limitation of the offspring of the leading class. When the highest class disappeared, the next in the social scale took its place. This had happened already about 400 B. C., when Greece stood at the zenith of its culture. At that period four-fifths of the populations of the classic culture-states consisted of liberated slaves. With the ascent to the higher social level, the newcomers gave themselves to the same practices as their predecessors and disappeared in the same way. This ascent and disappearance were repeated again and again until, at the time of

Plybios 200 B. C. entire Hellas suffered from a dearth of children. The same conditions were repeated in Rome under the Cæsars. All the better classes, not only the patricians but also the plebeians, the proficient, the industrious, etc., suffered from voluntary sterility, and the cowards, idlers and degenerates continued to increase. The feeble in mind and body were allowed to survive, pampered by the philosophy of the new Christian creed that had just at that period conquered the Roman empire.

The same conditions are now being repeated in North America. If the native of Anglo-Saxon stock only would set a limit to his offspring, the loss would not be so great, his place could be taken, and is actually taken by a more recent immigrant, who is as proficient, as industrious and often as cultured as his predecessor. But the trouble is that the same immigrant begins the same practices as soon as he has reached a higher step of the social ladder. The same Russian Jewess who in her native country set her pride to follow the religious dictates of her race to increase and multiply, the same Italian or Irish woman who in her native country would not have thought to defy the tenets of the Catholic church regarding the limitation of offspring, will ask her physician for some anti-conceptional remedy, as soon as she has reached a certain degree of affluence. With wealth and power come love for luxury and ease, and the consequence is the limitation of the offspring.

The danger lurking here in America is not that the character of its inhabitants is changing through the increased immigration of southern and eastern races—there are individuals good and bad in all classes and races—but that the better elements of these races are also weeded out and through overworked Judeo-Christian charities the degenerates are allowed to increase and multiply, more even than in ancient Greece and Rome. The success of modern medicine and hygiene in preserving the feeble children, in diminishing infant mortality and in combating epidemic diseases, all of which, in former years, killed off the feeble and sickly also works against natural selection. These feeble and degenerate have the tendency to have big families, and since the provident and select members have only one or two children, we will naturally in time become a race of defectives and degenerates. It is only the colossal Teutonic conceit, with its claim that its race is composed of higher fibre than any other race on earth, which raised the cry of the deterioration of the American population by the change of the character of the recent immigrants.

The fear that the Anglo-Saxon race may die out in the western hemisphere is entirely ungrounded. Civilizations, or empires may die, but races never. When in the minority, the smaller race becomes submerged into the more numerous, but it never disappears entirely. The disappearance of the blue-eyed blond individuals in Italy, France and Spain is no proof of the disappearance of the

Teutons in these countries. The light color had to disappear, when there is panmixia between the blond and brunette types, according to the Mendeleian law of the dominance of the black color and the recessiveness of the light color.

Thus the theory of the disappearance of the Teutons in the Mediterranean countries cannot stand the test of scientific critique. Hence the entire conjecture of the Aryan builders of all the civilizations of the world and their speedy disappearance is a mere fancy of the Renans, Gobineaus, Chamberlains and Woodruffs. If the Teutons were really such civilization-builders, what did the West Goths achieve in Spain in the 300 years from the foundation of their kingdom in 419 to the battle of Xeres de la Frontera in 711? What have they done in their mountains for Spain's culture from 711 to 1492 when the Arabs lost their last possession in Granada. During this period these same Arabs, according to Woodruff an inferior Semitic tribe, created the highest culture in science, literature, architecture, etc., which Spain has ever seen.

There is no particle of proof that only the fair, tall and long-headed Teutons are the intellectual giants. In a hand to hand duel the taller northern type may have a certain advantage over the smaller Mediterranean type. But mental capacity is independent of stature, and the brain-capacity of the long-head is not higher than that of the broad-head. "There is no record of any race that established itself in virtue of great stature or exceptional muscular strength," says Saleeby ("Parenthood and Race-Culture"). Stature is a point to breed for in the race-culture of giraffes and muscle in the race-culture of the hypopotamus; for man it is mind. The greatest soldiers of history (Hannibal, Cæsar, Napoleon) have been physically the smallest. Giants are essentially an unfavorable variation. The glandular activities which make for great stature and bulk make against intelligence.

Stature is composed of three elements, (1) height of skull, (2) length of neck and trunk, and (3) length of legs. In the majority of cases it is the long legs which cause the tall stature. The sitting height of the tall man seldom differs from that of the small man. The tall man may sometimes even lose in sitting. "When they stood, Menelaus towered above with his broad shoulders, when both were sitting Odysseus was the more venerable," says Homer (*Iliad* III, 210). Except the height of the cranium the other two elements, trunk and neck, can scarcely have any influence upon the individual's intellect. Now the height of the cranium does not mean a larger brain. Woodruff himself says: "There is a closer blood-relationship between long-headed Africans and Teutons." The African negroes are all mostly dolichocephalic, and no one will maintain that they possess higher intelligence than the brachycephalic Alpine type or Semites like Philo, Spinoza, Mendelsohn, or Bergson.

Hence, except in micro- and macrocephalia which are pathological anomalies, the shape of the head or the stature, as a whole, has no influence upon the volume of the brain or upon the mental capacities of man. There is no scientific relationship between brawn and brain, and it is the brain which is needed for the great achievements of civilization. Civilization means the conquest of nature by man. What is of the greatest importance in this struggle are mental traits, such as intelligence, memory, accuracy, judgment, initiative, loyalty, determination, perseverance; and these traits are found in every race. If we wish to usher in a new era and a new stock of men, we have to focus our energies upon the prevention of the multiplication of individuals below a certain moral and intellectual standard, not upon the breeding of pure types, whether it be the Alpine, Mediterranean, or the northern Teutonic type.

The panmixia is not such a curse as Chamberlain tries to make believe. The highest state of culture was reached in countries with mixed population, such as France, Germany, England and the United States. The comparatively pure Teutonic Scandinavians do not lead the world in art, science or industrial achievements. The descendants of mixed marriages are not at all degenerated. This is proved by the half-Jews Montaigne, the astronomer Sir John Herschel, Paul Lindau, George Ebers, Paul Heyse, Ludovic Halévy, Bret Harte, Daniele Manin, Léon Gambetta, Elie Metchnikoff, Sidney, etc. The panmixia in the United States is beyond dispute, yet these American hybrids do not yield the palm of achievement and progress to any country, be it Scandinavia or the British Islands.

Hence there is no need for a revolutionary change of the marriage relations as proposed by the different brands of race-culture. The ultimate apotheosis of the world will never be reached by the superman on the terms of Nietzsche. The novel and revolutionary doctrine as to choice of parents has sprung in essentially unbalanced minds. If only those undesirables who become a public charge, either in prisons or in asylums—and sooner or later they all land there—are one way or another (it is preferable that even the testicles or ovaries should perish in such individuals than that morbidity should be propagated) prevented from the propagation of their kind, the anti-selection, now at work, would cease. The degeneration of the human race could be stopped, even under the present conditions of human cultivation. Nature, as hitherto, would then take care of the occasional production of the necessary variations or sports in the service of the advance and progress of humanity. The production of a uniform type of men is not an eugenic ideal, and it can only be accomplished by the destruction of man's personal liberty. The loss would outweigh the gain. Man's ideal is the advent of a joyous and free society.

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TENDON REFLEXES AND BONE REFLEXES.*

By DR. J. BABINSKI, of Paris,

Lectures delivered at the Hospital de la Pitié, reported by Drs. Albert Charpentier and J. Jarkowski, and reviewed by the author.

(Translated, with some additions in brackets, by Charles Gilbert Chaddock, M. D., of St. Louis.)

(CONTINUATION.)

Neuritis.—From the point of view of relative importance of irreflexivity in the symptomatology of nervous diseases, next after tabes come the various forms of neuritis.

In the great majority of cases of neuritis we observe enfeeblement or abolition of the tendon and bone reflexes, and we here have a capital sign for diagnosis. Abolition of the reflexes occurs in all the kinds and varieties of neuritis, whether the lesion involve more particularly the motor fibres, or whether it implicate especially the sensory fibres; it is found not only in the grave forms with reaction of degeneration, but also in the form of neuritis known as periaxial (Gombault).

As in tabes, the irreflexivity of neuritis may be generalized or localized. It follows the course of the malady: in case the neuritis is generalized from the beginning, we find sometimes, at the very first, abolition of all the reflexes; in other forms, the evolution of which is slow, irreflexivity extends progressively. It may be the only manifestation of the affection, but this is much rarer here than in tabes. In contrast with what is seen in the disease of Duchenne, it is not rare in neuritis to observe reappearance of the reflexes and their return to a normal state after having been abolished. It should be added that the regression of irreflexivity is usually preceded by disappearance of other disturbances that characterize neuritis (pains, paralyses, amyotrophies, etc.). Sometimes the reappearance of the reflexes is very rapid; this, for example, is especially true of periaxial neuritis and that due to diphtheria.

The various varieties of neuritis do not present any notable differences of irreflexivity. However, certain forms determine by preference abolition of certain reflexes. Thus, alcoholic neuritis, which affects with predilection the lower extremities, presents especially abolition of the knee-jerks and ankle-jerks; on the other hand, neuritis due to lead attacks principally the upper extremities and sometimes causes abolition of the reflexes only in these members.

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We have just considered tendon irreflectivity in the forms of polyneuritis. From the same point of view the localized forms of neuritis should be briefly examined. We shall not review them all, but limit our attention to sciatica, which is the most common of all forms of localized neuritis; and to radial neuritis, a much rarer form—concerning which I have made some new observations.

In sciatic neuralgia, irreflectivity may be wanting, and the diagnosis is then made, in particular, on the existence of certain painful points (Valleix), the sign of Lasègue, and the scoliosis which was studied by Charcot and myself.* However, when the reflex of the tendo Achillis is present, it is often difficult to affirm the existence of a lesion of the sciatic nerve. The differential diagnosis of this form from pseudo-sciatica (hysterical neuralgia) is sometimes impossible. On the other hand, the absence of the Achilles reflex, a phenomenon quite common in sciatica, permits us to put aside any idea of suggestion or simulation, and to establish with precision the existence of a neuritis (Sternberg, Babinski, Forestier).**

It must be noted that a sciatic neuritis with abolition of the ankle-jerk is not necessarily accompanied by violent pains, for it may be painless and benign; that, on the other hand, sciatica, with unaltered ankle-jerk, sometimes gives rise to atrocious pains and to scoliosis.

Radial neuritis, in the form that I have described,† is characterized by violent, lancinating pains predominating in the posterior region of the arm, by slight amyotrophy of the brachial triceps with simple diminution of electric contractility, and by abolition of the reflex of extension of the forearm on the arm.

Anterior Poliomyelitis.—While in neuritis we have to do with irreflectivity due to lesions of centripetal and centrifugal paths, in poliomyelitis this symptom is due to lesion of the reflex centres themselves—to a lesion of the cells of the anterior horns.

In poliomyelitis the irreflectivity is diverse, as might be expected, since this affection presents numerous varieties which I have no need to describe here in detail. It goes without saying that it affects a varying number of reflexes, depending upon whether the actual lesions are more or less extensive: it sometimes implicates all four limbs, at times the upper extremities or the lower limbs, or only one member; it is sometimes localized in a single reflex mechanism. The reflex of the tendo Achillis may be abolished while the knee-jerk remains, or inversely.

With regard to its evolution, there is reason to consider separately the irreflectivity of chronic poliomyelitis and that of acute poliomyelitis. In the former, it develops only very slowly; it is

*Sur une déformation particulière du tronc causée par la sciatique, par J. Babinski, *Arch. de neurologie*, No. IV, p. 43, 1888.

***Société méd. des hôpitaux de Paris*, p. 887, 1896: Abolition du réflexe du tendon d'Achille dans la sciatique, par J. Babinski.

†J. Babinski: Névrite radiale. (*Revue neurologique*, p. 734, 1903.)

preceded by subreflectivity which itself need not appear at first in the affection of which amyotrophy may be the first objective sign. A muscle group is sometimes much atrophied without abolition of its reflex; nevertheless, irreflectivity is usually established before muscular atrophy is complete. In chronic poliomyelitis subreflectivity and irreflectivity do not regress.

In acute poliomyelitis the enfeeblement or abolition of the tendon reflexes occurs suddenly in the territories affected by the lesions, and is, for diagnosis and prognosis, an objective sign of the greatest value. It is evident that subreflectivity depends on alterations less profound than those which cause irreflectivity. But the latter is not a certain index of irremedial disorder of the nerve centres. The tendon reflexes may reappear, at least in part; in many cases in which at first the domain of subreflectivity and irreflectivity is very extensive we see it grow progressively smaller.

Finally, there remains to be mentioned among the diseases in which irreflectivity is a cardinal sign, Friedreich's disease, a variety of combined sclerosis of the cord. Although in this affection, with lesions of the arcs of the tendon reflexes, there is sclerosis of the pyramidal tracts, the tendon reflexes seem always to be abolished or enfeebled. If in neuritis and in acute poliomyelitis, as I have said, the reflexes, after having been abolished, reappear and become normal; if even in tabes, though exceptionally, we observe return of the reflexes—in particular under the influence of an alteration of the pyramidal tracts (hemiplegia)—irreflectivity is always permanent in Friedreich's disease.

GROUP II.

When intraspinal lesions, like those of myelitis, neoplasms, hemyomyelia, implicate the fibres or the cells of the arcs of the tendon reflexes, they induce enfeeblement or abolition of the corresponding tendon reflexes; in this respect they resemble anterior poliomyelitis. Let us take a few examples. A myelitis which destroys the lumbar enlargement determines loss of the knee-jerks. A lesion of the cervical enlargement sometimes causes abolition of the tendon reflexes of the upper extremities; in such a case the state of the reflexes of the lower extremities will depend upon divers circumstances: they may be abolished or exaggerated, in accordance with whether the affection has been of short or long duration. This is a point we shall have to examine later. If the lesions of the cervical cord, instead of implicating the whole of the enlargement, destroy but a limited portion of it, the reflexes of the upper extremities will be disturbed only partially; and then we may find the paradoxical reflex of the elbow, the inverted radial reflex, or some other form of dissociation. Thus, we may be able to determine, by study of the reflexes alone, the seat of the alterations, and sometimes their limits. However, with relation to syringomyelia and gliosis, it would be

rash to localize the limits of the lesion by deductions from the state of the tendon reflexes. Suppose that the reflex of flexion of the forearm on the arm is alone abolished. We should not then conclude that the lesion is limited to the fifth spinal segment; in spite of the integrity of the other tendon reflexes of the upper extremity, the cavity in the cord may have invaded all the cervical region. The interpretation of this fact is, however, simple enough: the lesions of syringomyelia may extend through many segments of the cord without implicating the reflex arcs.

Let us now consider the perimedullary lesions that may give rise to irreflexivity: fracture of the vertebral column, dislocation of the vertebræ [hemorrhages], Pott's disease, forms of meningitis, tumors of the meninges. In such conditions, irreflexivity results either from compression of the cord, and is then analogous to that caused by intramedullary lesions which we have just studied, or to a lesion of the nerve roots. It should be noted, however, that compression of the roots does not always suffice to abolish the reflexes. Jumentié, Jarkowski and I presented to the Neurological Society a case of hypertrophic meningitis in which the reflexes were not abolished, although the roots were surrounded by the inflammatory tissue and the lesions had caused considerable muscular atrophy.

In spondylosis, the abolition of the knee-jerks and of the ankle-jerks sometimes observed, as I have shown, is probably dependent on propagation of the inflammatory process to the radicular or mixed nerve. This irreflexivity, when it is associated with lightning pains, might, if care were not exercised, be thought to be due to tabes. In order to emphasize this point, I have called this form of spondylosis 'spondylosic pseudo-tabes.'*

It remains for us to see in what measure diseases of the muscle itself are capable of producing tendon and bone irreflexivity. Several authors have noted enfeeblement or abolition of the reflexes in acute myositis. One readily understands that alteration of a muscle might interfere with its physiological functions. But what interests us here especially are the diseases of muscles that lie close to the confines of diseases of the nervous system.

Let us first consider primary progressive myopathy. It is admitted that, in primary myopathy, the reflexes diminish and finally disappear with the progress of the atrophy. However, Landouzy and Déjerine, Erb, Marie, Guinon, Léri, and others have reported abolition of the knee-jerk before the quadriceps was appreciably atrophied. Déjerine and Landouzy find this fact inexplicable. Other authors think the reason of this phenomenon should be sought in concomitant nervous lesions. Jarkowski and I** have studied

*J. Babinski: Pseudo-tabes spondylosique. (*Revue neurologique*, p. 645, 1903.)

**J. Babinski et J. Jarkowski: Sur l'excitabilité idio-musculaire et sur les réflexes tendineux dans la myopathie progressive primitive. (*Revue neurologique*, 1st Semestre, p. 778.)

some facts of this kind, and basing our conclusion on the coincidence of abolition of the tendon reflexes with idio-muscular inexcitability, we suggested the hypothesis that irreflexivity in myopathy is due to a peculiar alteration of the muscle.

The affection described by Erb in 1878, now commonly called 'myasthenia gravis,' and generally considered, since the works of Goldflam and Joly to be a disease of the muscles*—can it provoke irreflexivity? A few cases of myasthenia have been reported showing enfeeblement and even abolition of the tendon reflexes. Steinert claims to have seen the reflexes temporarily abolished. In reply to my inquiry on this point, Erb informed me that he had noted sometimes diminution of the reflexes but had never seen them abolished. My personal observations are in harmony with those of Erb.

Let us finish this portion of our subject by consideration of the tendon reflexes in 'periodical paralysis,' an affection that is very rare in France, but seen especially in Germany, Poland, and Russia. I am inclined to believe that this disease belongs rather to pathology of muscle than to that of the nervous system; the absence of the characteristics of the reaction of degeneration and the abolition of idiomuscular excitability are, in my opinion, arguments which support this idea. This is why I place this affection immediately after progressive muscular dystrophy and myasthenia. During the attack of the paralysis, which usually involves the four limbs, the trunk, and the neck, there is simultaneous abolition of voluntary movement, of electrical excitability of nerves and of muscles, of idio-muscular excitability, and of the tendon reflexes. All these phenomena develop progressively, and after having lasted a few hours, disappear progressively, little by little, as they appeared. This is the only known affection in which the tendon reflexes behave in such a manner.

Lesions Located Above the Centres of the Tendon Reflexes.—We have just considered the different lesions of the reflex arc that induce irreflexivity. Can this disturbance be caused directly by an alteration of the nervous system above the level of the centres of the tendon reflexes? That is the question we are about to discuss. It is incontestable that some lesions, occurring suddenly and provoking the phenomena of shock, are often accompanied by tendon and bone irreflexivity. A sudden apoplectic stroke, sudden compression of the spinal cord, acute myelitis, hematomyelia, may tem-

*[Kuh and Braude (*Journ. Nervous and Mental Dis.*, Vol. XL, No. 10, 1913), from a very thorough microscopical study of the entire nervous system of a case of myasthenia gravis, made in the laboratories of the University of Chicago, conclude that probably this disease "is of neurogenic rather than of myogenic origin—certain peculiar vascular findings may account for the distribution of its symptoms and the usual mode of death. These vascular changes in our case consisted in the presence of polymorphonuclear thrombi most numerous in the pons and medulla, thus accounting for the preponderating bulbar symptoms of the disease." The tendon reflexes of the upper extremities, especially, were diminished, and temporarily absent.]

porarily abolish the reflexes below the level of the nervous system that is implicated. But when the phenomena of shock have disappeared, the tendon reflexes reappear if the reflex arcs have not been injured. However, we must inquire whether in some other cases the irreflexivity may not be permanent.

With regard to this point, we shall examine in some detail the widely accepted view, known under the name of the law of Bastian, stated for the first time by that author in 1890, that a total solution of continuity of the cord, especially in the cervical or cervico-dorsal region causes abolition of the tendon reflexes in the subjacent segments.

To explain this fact, Bastian adopts the hypothesis, enunciated by Jackson, that the cerebellum has an excitatory influence on the medullary reflex centres, while the psychomotor region of the brain exerts over them, through the pyramidal tracts, a restraining influence.

Bruns, Déjerine, Nonne, Marinesco, etc., were the first to accept Bastian's view in favor of which two orders of facts were invoked: (1) *Anatomo-clinical observations*, in which there was complete destruction of the cord, shown, with other signs, in abolition of the tendon reflexes; (2) *clinical observations* in which the tendon reflexes and sensibility diminished and disappeared simultaneously.

On the other hand, it had been known for a long time that section of the cord of the frog induced exaggeration of the reflexes below the lesion. After Bastian's publication the question was taken up again experimentally, and I give what seem to be the results of the work done by Gad and Flatau, Lapinski, Sherrington, Sternberg, etc. In the rabbit and the dog, section of the cord in the dorsal or the cervical region may, it is true, cause diminution or abolition of the tendon reflexes of the lower extremities, but these disturbances are temporary. In the monkey, according to Sherrington, the duration of the shock is longer than in the dog or the rabbit, but the abolition of the tendon reflexes in the monkey is also not permanent.

An observation, which has the value of a laboratory experiment, was made by Barbé on a man who had been guillotined. This author wrote as follows (1885) in the records of the Society of Biology: "The observation was begun a little more than a minute after the execution. The limbs were in complete resolution. I discovered no trace of erection or of ejaculation. Then, raising the right leg, I obtained very distinctly the knee-jerk. Appreciating the importance there was in establishing that this reflex was certainly present after decapitation, I begged the students who had accompanied me to give the closest attention to the renewed tests I was about to make, and all were able to note with me that this reflex persisted for eight minutes after the execution."

At first sight, this observation seems decisive. However, it might be objected that the effects of the excitatory influence of the

cerebellum—Jackson's hypothesis—continued for a time after section of the cord. But there have been published cases of complete section of the cord, anatomically verified, in which the tendon reflexes existed until death—the observations of Kausch, of Joly and Lapinski, and of Henneberg. If these are exact, they at least establish the fact that in man, as in animals, section of the cord does not necessarily cause abolition of the tendon reflexes below the lesion. Then, therefore, Bastian's proposition can no longer be called a law.

The fact remains, however, that in man, in the majority of cases of complete transverse destruction of the cord, there is abolition of the tendon reflexes below the level of the lesion.* If this irreflectivity does not depend directly on the solution of continuity of the cord, it must depend upon some indirect causes which should be discovered. There are a certain number of well-observed facts where it was possible to establish that coexistent lesions of the reflex arcs had to be considered as a cause. In these cases the irreflectivity is readily interpreted. In the absence of appreciable alterations of the tendo-reflex paths, we may still ask whether certain spinal lesions of a special nature may not provoke in the subjacent part of the cord a disturbance comparable to that caused by operative shock, and which is permanent. Some investigators, among whom are Margouliès, Balint, and Lapinski, maintain that the state of the reflexes depends especially upon the modality of the lesion.

In support of this idea, I give a description of a very interesting experiment which Lapinski claims to have made: The cord in a dog is cut in two with a very sharp instrument in the cervical region, and soon after the operation the tendon reflexes are found to be present. A few days later the free upper (cut) end of the lower portion of the cord is crushed by compressing it several times with pincers, and thereafter the tendon reflexes disappear permanently. Finally, another section of the cord is done below the crushed portion; thereafter the tendon reflexes reappear.

In what degree is there analogy between these facts of experimental pathology and what is observed in man? I ask the question without attempting to answer it.

A large number of cases have been reported in which encephalic changes, due especially to tumors, have abolished the tendon reflexes. Very often these are lesions implicating the cerebellum. These facts seem explicable, according to Jackson and Bastian, by the excitatory influence which is normally exercised by the cere-

*It should be noted that irreflectivity in the lower extremities has been reported in many cases in which the lesions of the cervical cord were only incomplete. I have, myself, reported (*Archives de Médecine expérimentale*, No. 2, 1891—Flaccid paraplegia due to compression of the cord) a case of compression of the cervical cord, in which I noted abolition of the knee-jerks without any disturbance of sensation.

bellum on the medullary centres. But the majority of authors, among them Oppenheim, Bruns, Bechterew, regard such irreflexivity as dependent on coincident radicular lesions distant from the tumor and caused either by increase of pressure in the cerebrospinal fluid or by toxic products. Collier and Nageotte have published some facts that are absolutely demonstrative in this respect. At all events, generalization on this subject is not yet permissible.

(TO BE CONTINUED.)

INTIMATE AUSCULTATION OF THE APEX—A NEW METHOD.

By ARTHUR C. JACOBSON, M. D., of Brooklyn, N. Y.,
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City of New York.

The writer has found the method described in this communication useful in the diagnosis of early apical lesions. Every keen and conscientious practitioner avails himself of the advantages of supraclavicular and suprascapular auscultation of the apex, but so far as the writer knows we have hitherto failed fully to avail ourselves of peculiarly favorable anatomical conditions. By reason of the fact that the apex of the lung passes well up into the base of the neck it is possible to get it between two Bowles' stethoscopic



diaphragms, these diaphragms being then very close together, something not feasible elsewhere over the lung. The method has no application except at the apex. Sounds otherwise faint or inaudible are brought out clearly. The two chest pieces are united to the aural apparatus by two Y joints. The writer uses diaphragms cut out of ordinary sheet mica because of their sensitiveness. The protective metal covers which are furnished with the instruments prevent fracture of the mica when the stethoscope is carried in the pocket or bag.

MEDICAL AND SURGICAL PROGRESS.

THE ROENTGEN RAY IN DUODENAL DIAGNOSIS.

A REVIEW OF RECENT LITERATURE.

By E. H. SKINNER, M. D., of the Editorial Staff.

1. Barclay: The Stomach and Esophagus. A Radiographic Study. pp. 54-61. New York: Macmillan Company. 1913.
2. Carman: The Technique of Roentgen-Ray Examination of the Gastro-Intestinal Tract and the Interpretation of Screen and Plate Findings. (*Journ. Amer. Med. Assoc.*, pp. 321-326, Vol. LXI.)
3. Cole: A Roentgen-Ray Table for Serial and Stereoscopic Radiography and Fluoroscopy. (*Archives Roentgen Ray*, Vol. XVIII, pp. 147-150.)
4. Cole: Radiographic Study of the Pylorus and Duodenum, With and Without Artificial Dilatation of the Duodenum. (*Archives Roentgen Ray*, Vol. XVI, p. 425.)
5. Cole: Physiology of the Pylorus, Pilleus Ventriculi and Duodenum as Observed Roentgenographically. (*Journ. Amer. Med. Assoc.*, Vol. LXI, pp. 762-766.)
6. Cole: Serial Radiography in the Differential Diagnosis of Carcinoma of the Stomach, Gall-Bladder Infection and Gastric Ulcer. (*Archives Roentgen Ray*, Vol. XVII, pp. 172-181.)
7. George: The Positive Diagnosis of Duodenal Ulcer by Means of the Roentgen Ray. (*Amer. Quart. Roentgenology*, Vol. IV, p. 187.)
8. Mills: Points of Value in Roentgenoscopy of the Gastro-Intestinal Tract. (*Journ. Amer. Med. Assoc.*, Vol. LXI, pp. 134-150.)
9. Pfahler: The Roentgen Rays in the Diagnosis of Gastric and Duodenal Ulcer. (*Amer. Quart. Roentgenology*, Vol. IV, p. 156.)

There has accumulated an enormous array of literature upon the rôle of the Roentgen ray in duodenal diagnosis. There have been two approaches, one, the fluoroscopic signs or the Continental method, and the other serial roentgenography as proposed by Cole, an American. The adherents of fluoroscopy have insisted upon the necessity of careful case histories in evolving a diagnosis of duodenal ulcer. Cole has insisted upon the serial exhibition of duodenal defects in outline as sufficient identification and foundation for the establishing of duodenal diagnosis. George has reduced the

onerous technique of Cole to practicality, and offers splendid evidence of the value of his method in the positive and negative diagnosis of duodenal ulceration.

Cole believes that his method of serial radiography as conducted upon his special table provides a combination of fluoroscopy and radiography. Now, it may be granted a table constructed upon the Cole principle provides a splendid arrangement for securing Roentgen negatives at the proper time during digestion, but it does not provide suitable fluoroscopic inspection. In the first place, one sees the fluoroscopic image from a reflection in a mirror, and, secondly, at a considerable distance. Again, the technique of serial radiography precludes the necessary ocular accommodation and continuous darkness so necessary to fluoroscopic success.

Cole says: "Either serial or Roentgen cinematography must be employed before one is warranted in expressing any opinion regarding the condition of the wall of the stomach or duodenum, except in extreme nonoperable cases of carcinoma. There is no justification for a diagnosis on which a surgical procedure is to be based, unless two series of fourteen to twenty-four radiographs have been made, the second confirming the first in every essential detail."

This is certainly a burdensome technique to inflict upon the patient and purse of the patient and physician. It is not fair to find fault with any technique because of expense if such a technique is the only one which will provide definite results; but we would suggest a careful investigation of the technique which combines direct fluoroscopic inspection and interval plates of the duodenum as described by George. The latter method comes within a reasonable reach of more patients.

In Cole's article we find a detailed description of his radiographic indications of adhesions about the pylorus and duodenum which are:—

1. The lumen varies in diameter, but does not dilate to its normal size.
2. The rugæ show unusually distinctly, have a crinkled appearance, and run obliquely or transversely.
3. The peristaltic contractions are clear-cut in the normal portion, but cease or are distorted when they reach the adhesions.
4. The cap is constricted, asymmetrical, displaced, or absent.
5. The duodenum is angular or contracted.

In following Cole's radiographic technique it is probably necessary to make the large number of plates, but such a necessity does not arise if the patient is inspected before a vertical fluoroscopic screen during the administration of the opaque meal. The description by Cole of the abnormalities in the duodenal outline are important but are too lengthy to bear repetition here.

Carman outlines the Roentgen evidence of duodenal ulcer as follows:—

1. Early free opening of the pylorus, with early clearance of the stomach.
2. Lagging of bismuth in the duodenum.
3. Residue in the stomach (sometimes in the duodenum) after six hours, if there is an obstruction from scar contraction.
4. Pressure-tender point over the duodenum.
5. Dilatation of the cap.
6. Irregular outline of the cap or duodenum.
7. Diverticulum of perforating ulcer.

8. Vigorous peristalsis, especially if there is obstruction.

Carman incorporates the following reservations in his article: "Radiological diagnosis of duodenal ulcer, unless corroborated by clinical data, is in most instances a mere guess. Excluding obstructive cases, the Roentgen-ray appearance of duodenal ulcer is often seen when the actual lesion is elsewhere, as in the appendix or gall-bladder.

The Roentgen-ray findings, unless extraordinarily marked and decisive, should be correlated with the anamnesis, the laboratory reports, the clinical data, and always with common sense."

Pfahler is very conservative in his estimation of Roentgen evidence in duodenal ulcer. He holds practically to the same findings as Carman, and adds that the presence of occult blood in the stool in association with the Roentgen evidence points to acute ulcer. In his conclusions Pfahler says that *some* evidence of duodenal ulcer can be found by the Roentgen method and that the case history and other clinical evidence should not be neglected to arrive at an accurate diagnosis.

Mills may be quoted as follows: "Ulcer of the duodenum gives less valuable Roentgen-ray evidence than does gastric ulcer. Most duodenal ulcers occur in the first portion of the duodenum, recognized roentgenoscopically as the 'cap.' A persistent deformity of this cap may indicate ulcer. The cap may be drawn out of position or deformed by adhesions secondary to ulcer periduodenitis. Overprompt initial gastric motility has been repeatedly mentioned as an indication of duodenal ulcer. Such hypermotility occurs, however, in other conditions, notably those causing hypo-acidity. The form of the stomach in duodenal ulcer seems different from that of gastric ulcer, being higher and more transverse. Hyperperistalsis is another usual accompaniment. A pressure-sensitive point overlying the ulcer seems more constant in duodenal than in gastric ulcer. It can only be a reflex whose registration with the ulcer region is coincident.

"The method can be of greatest worth only if correlated with the clinical findings. To estimate its value alone is decidedly interesting and furnishes a check to over-enthusiasm but does not indicate its true efficiency. Roentgenoscopical evidence if unsupported by clinical findings must be overpoweringly suggestive to gain recognition. This means that, at least at present, the medium can be most effective only if used conjointly by clinician and roentgenologist, and if both realize that clinical training is the essential in the correct interpretation of Roentgen-ray findings. Regarding the question of the relative value of fluoroscope and plate in gastro-intestinal roentgenoscopy, I believe that the two used conjointly more than double the value of either alone; but of the two, that the fluoroscope is of decidedly greater worth."

Barclay has confessed to an inability definitely to determine a Roentgen diagnosis of duodenal ulcer, but he offers as follows a symptom-complex which he terms duodenal irritation:—

1. The stomach always exhibits good tone, even if ptosis is present. Hypertonus is often noted.
2. The peristalsis is more active than normal, especially when the food has commenced to pass through the duodenum.
3. The food begins to leave the stomach almost at once, and as a rule continues to pass out very rapidly until the stomach is empty.

4. The pyloric relaxation is so complete that large masses of food are seen passing through the duodenum instead of the fine, almost imperceptible stream that can only be detected with certainty by means of an instantaneous radiogram. In certain cases a separate bolus is seen remaining, apparently in a pocket, in the duodenum.

The value of this symptom-complex is considerable when we realize that operative analysis of Barclay's 39 reported cases resulted as follows: Duodenal ulceration, 14 cases; cicatrization of the duodenum, 7 cases; adhesions about duodenum (generally in connection with gall-bladder), 13 cases; carcinoma of this region, 3 cases; appendicitis, abscess, 1 case; appendix fixed by adhesions near duodenum, 1 case.

Barclay's work is entirely fluoroscopic.

The work of George is illuminating. He gives all credit to Cole for the institution of serial Roentgen plates of the duodenum, which is the basis of his method. George does not use the large number of plates which Cole considers necessary, and they are not taken in such a rapid series, rather should the term interval exposures be used. George uses the Roentgen exposures of the duodenum to supplement his fluoroscopic examination of the entire gastro-intestinal tract. He uses no special table which combines fluoroscopic inspection. He first examines his patient with a vertical fluoroscopic apparatus at the time the bismuth meal is administered, and then makes one large plate of the abdomen to locate the duodenum in relation to the umbilicus, using smaller plates for the duodenum alone.

George's analysis of the fluoroscopic signs of duodenal ulcer is so instructive that we shall quote at length from his article. He says, the two signs usually emphasized are (1) abnormally marked peristalsis and (2) gastric hypermotility. The first is due to muscular hypertrophy following pyloric spasm, but no diagnosis of duodenal ulcer should be made on the presence of marked peristalsis alone, as abnormal nervous influence may produce this as well as pyloric stenosis due to other cause than cicatricial ulcer. Exaggerated peristalsis may be absent in many cases which prove at operation to be duodenal ulcer, and he regards this sign as merely suggestive.

George believes that the emptying rate of the stomach is dependent upon two more or less opposing factors, first, mechanical obstruction of the duodenum or pylorus; and second, interference with the normal reflex control of the pylorus.

In referring to the fleck of bismuth which persists in the upper duodenum at various intervals after the ingestion of the bismuth meal, he does not consider this so important. Penetration rarely occurs in duodenal ulcer in comparison with cicatricial contraction. Stenosis of the duodenum, manifested by retention of bismuth which is induced by cicatricial changes or spasms usually at some point in the transverse (third?) portion is of doubtful value, as most duodenal ulcers occur in the first portion of the duodenum. Fixation of the pylorus and first portion of the duodenum is very important, but found in few cases of duodenal ulcer. He considers them very definite when found and most easily demonstrated by the fluoroscopic method.

George believes that the above-mentioned signs, if present, merely support the clinical diagnosis but do not make it positive, and that

the chief trouble in the Roentgen method, up to the present time, has been too much reliance upon purely fluoroscopic findings. Therefore, he advises the addition of the serial method of Cole in order that the detail of the duodenal anatomy may be obtained.

George finds it impossible to obtain shadows of the duodenum by a single technique. In some cases the negatives are made with the patient lying upon the abdomen, but in a large proportion of cases he finds it necessary to take the plates with the patient standing. In patients with an adipose abdominal wall, the duodenum is usually directly behind the pylorus and it, therefore, becomes necessary to make exposures with the patient in the lateral position and the plate under the right side. While George does not indicate any exact number of plates, it can be inferred from his article that he does not use more than three or four repeated plates with the same technique taken at different times and sometimes on different days. He states: "If now, the duodenal defect persists in all these plates, taken at different times, and sometimes on different days, then we feel confident and positive in stating that there is a real pathological condition of the duodenum. We feel that this persistent break in the continuity of a normal duodenum is as positive a diagnostic point as the break in continuity of cortical bone in the Roentgen plate of a fracture. What we are able to recognize in the duodenum is not the duodenal ulcer *per se*—that is the actual mucous membrane erosion—but we demonstrate the effect on the bismuth mass of cicatricial contraction, stenosis, perforation, adhesions, and penetrating effect of a chronic ulcer.

"The effect of adhesions produced during the healing of an old duodenal ulcer cannot always be differentiated from the actual defect due to the ulcer itself, or from the crater of the cicatrix. In all of these conditions, however, although we may have the same smoothly-rounded or irregular defect, we can tell that the duodenum is not normal, but that it is definitely pathological. In questions of fixation of the duodenum by periduodenitis, the fluoroscope does play an important part. By its use we can tell whether or not an apparent right-sided position of the stomach is due to accident, or to actual fixation of the duodenum to the region of the gall-bladder or the colon. It is only, however, by following out the above-mentioned technique, with serial Roentgen plates, that we can determine whether these adhesions are due to an old healed ulcer of the duodenum or to gall-bladder disease.

"A 'normal' bismuth mass in the duodenum means, of course, that there are no cicatricial contractions, no adhesions, perforations, sacculations, etc. The only thing that could possibly be present is a simple peptic erosion of the mucous membrane not involving the muscularis. This condition, while quite common in simple gastric ulcer, is practically unknown with duodenal ulcer. The latter very soon becomes callous, and will then show its effects upon the bismuth mass. At any rate, a case that is manifesting itself by any clinical symptoms is sure to be more than a simple erosion. Moynihan, in his monograph on duodenal ulcer, says: 'A duodenal ulcer, which has been the cause of protracted and recurrent symptoms, is always visible from the outside of the intestine, is always palpable, and therefore is always demonstrable. To this statement there are no exceptions.' If this be true, an ulcer which can be seen from the outside and can be palpated at operation is sure to disturb the outlines of the contained bismuth mass.

We can therefore safely neglect the possibility of simple mucous membrane erosion, and flatly state that a duodenum which can be demonstrated as anatomically normal by our method does not contain an ulcer, at least an ulcer which calls for surgical interference."

There should be no dispute as to whether the fluoroscopic or the radiographic technique is necessary in an abdominal Roentgen examination because one supplements the other. In duodenal diagnosis the radiograph becomes absolutely necessary because of the increased detail of filling-defects. It will probably be necessary for one pursuing the Cole technique without the advantage of direct fluoroscopic inspection to make the large series of exposures at short intervals. But to one who pursues what may be termed Continental fluoroscopy it will only be necessary to take a few interval or repeated exposures of the duodenum to arrive at George's method and results. Attention to the fluoroscopic symptom-complex of duodenal irritation as outlined by Barclay, and the interpretation of plates according to Cole and George, will promote the reliable return of diagnostic data upon the duodenum.

PYELOGRAPHY IN DIAGNOSIS OF RENAL DISEASES.

A REVIEW OF RECENT LITERATURE.

By JOHN R. CAULK, A. M., M. D., of the Editorial Staff.

1. Baker: An Important Method of Measuring Capacity of Renal Pelvis. (*Surg., Gyn. and Obstet.*, p. 536, 1910.)
2. Braasch: Deformities of the Renal Pelvis. (*Ann. Surg.*, p. 534, 1911.)
3. Braasch: Recent Progress in Pyelography. (*Journ. Mich. State Med. Soc.*, No. 4, p. 189.)
4. Braasch: Value of Pyelography. (*Journ. Amer. Med. Assoc.*, Vol. LVII, No. 25, p. 1986, 1911.)
5. Braasch: Clinical Data on Malignant Tumors. (*Journ. Amer. Med. Assoc.*, Vol. LX, No. 4, p. 274, 1913.)
6. Cabot: Diagnosis and Indication for Operation in Early Hydronephrosis. (*Journ. Amer. Med. Assoc.*, p. 16, January 4th, 1913.)
7. Childs and Spitzer: Roentgenographic Study of Normal Kidney, Its Pelvis and Ureter. (*Journ. Amer. Med. Assoc.*, Vol. LXI, No. 12, p. 925, 1913.)
8. Fowler: Early Diagnosis of Hydronephrosis. (*Surg., Gyn. and Obstet.*, p. 137, February, 1912.)
9. Kelley (*Bull. Johns Hopkins Hospital*, April, 1906).
10. Kelly and Lewis: Silver Iodide Emulsion. A New Medium for Skiagraphy of Urinary Tract. (*Surg., Gyn. and Obstet.*, Vol. XVI, No. 6, p. 707, 1913.)
11. Legueu: Technique and Accidents of Pyelography. (*Arch. Urol.*, Fas. 1, 1913.)
12. Lichtenberg and Dietler: The Localization of the Pelvis and Ureter Roentgenographically after Filling with Oxygen. (*Muench. med. Wochenschr.*, No. 25, Vol. XX, p. 1341, June, 1911.)
13. Nogier and Reynard: Collargol Injection of the Pelvis in Diagnosis of Renal Affections. (*Lyon chir.*, December, 1911.)
14. Tennant: Cause of Pain in Pyelography. (*Ann. Surg.*, Vol. LVII, p. 888, 1913.)
15. Thomas: An Apparatus for Injection and Lavage of Pelves of Kidneys and Ureters. (*Journ. Amer. Med. Assoc.*, Vol. LX, No. 3, p. 184, 1913.)
16. Uhle: Combined Cystoscopic and Roentgenographic Examination of Kidney and Ureters. (*Trans. Phil. Acad. Surg.*, Vol. XVIII, p. 19 and Vol XIII, p. 287, 1911.)

Pyelography, which consists in the filling of the renal pelvis with some substance impermeable to the *x*-ray and simultaneously taking a picture, was first introduced by Vœlcker and Lichtenberg,

who published their article in 1906. Since Vœlcker proposed this method many surgeons throughout the world have adopted it in clearing up many obscure renal conditions. In France, the chief advocates have been Albarran, Rafin, Arcelin, Nogier and Reynard; in Germany, Vœlcker, Lichtenberg, Dietlen, Döderlein and Krœnig. In America, Uhle and Pfahler were among the first. However, the most ardent enthusiast and promotor has been Braasch. In England, Walker has paid more attention to this particular phase. All these men have been extremely enthusiastic over the advantages of this method. The first author to raise any particular objection to it was Blum. Tennant, of Denver, and Albers-Schœnberg have also made mention of objectionable features. The opinion of these men will be considered later.

Methods.—Before discussing the various methods of pyelography it may be well to state that all agree that in no instance should a general anesthetic be used nor should sedatives be given before the procedure, because it is particularly important to have the patient capable of appreciating the onset of the first renal discomfort, if there is to be discomfort with the method, in order that there should be no damage done to the renal pelvis or kidney by too much intrarenal pressure.

There are three methods which have been utilized for filling the renal pelvis for pyelography. First, by means of various syringes which have been constructed for this purpose; secondly, by gravity; thirdly, by gas pressure. One of the first surgeons to utilize the syringe method in filling the renal pelvis for the determination of renal disease, particularly with reference to producing pain commonly associated with hydronephrosis, was Kelly. In his early work he did not undertake pyelography but merely attempted to determine the pelvic capacity. With the development of pyelography most of the authors used the syringe method in the beginning of their work.

There have been various syringes proposed. None has been found perfect. In fact, the great majority have been discarded for the reason that the pressure could not be properly regulated and controlled, and many of the untoward results which have been reported in pyelography have been due to too much pressure with the syringe. One of the best syringes which has been proposed is the one of Legueu, which consists of an ordinary barrel to which is attached a Y-shaped metal tip, with three stop-cocks, one on the main stem and one on each arm of the Y, so arranged that the fluid can be injected through both or one at a time. This method has fallen more and more into disfavor and is gradually being discarded.

The next, the most important and safest method—the gravity method—which consists in allowing the fluid to flow into the pelvis by means of atmospheric pressure, has been particularly advocated by Thomas, Braasch, and Baker, and more recently has been adopted practically by all engaged in this line of work.

The various instruments will not be considered in detail. The principle of them all consists in allowing the fluid to be injected to flow from a graduated burette, which is elevated a short distance above the level of the individual, generally 2 ft., into the renal pelvis by means of gravity. The one mistake of the Baker apparatus seems to be that he has a combination of pressure and gravity. The device of Thomas, which provides a safety valve for excess pressure, seems to be the safest apparatus. It is unques-

tionably true that by this method many of the complications which have been ascribed to pyelography under the syringe method may be obviated.

The third method, which consists of the injection of gas into the renal pelvis under pressure, was first utilized by Burkhardt and Polano. This method had its birth in the following manner. Eppinger filled the colon with gas to localize a shadow supposed to be in the left kidney, and by the thickness of the shadow of the intestine, he was able to locate a shadow as being posterior to the colon. Wittek and Eppinger filled the bladder with gas to differentiate a vesical tumor. Taking this clue, Burkhardt and Polano applied it to the upper tract. This method has never become generally popular. A few men, particularly Lichtenberg, Dietlen and Cole, have used it with great success. All believe it safe and reliable. Its greatest value and usefulness seems to be in the localization of pelvic stones. The method is similar to the other methods, being a simple ureter catheterization plus the forcing in of oxygen gas through the ureter catheter from a container. Lichtenberg and Dietlen state that there is practically no pain with this method and no unpleasant aftermath, and that the pressure in the renal pelvis cannot be sufficient to cause over-distention and injury as the gas will flow backward down the ureter between it and the catheter. With this method the authors claim that they can localize, better than in any other way, renal stones and intestinal concretions. Particularly, can they show the relation of pelvic stones, there being a dark background of the gas around the light shadow of the stones. Among the various materials which are used for pyelographic work are collargol, from 3 to 50 per cent., cargentos 50 per cent., silver iodide emulsion 10 per cent., bismuth emulsion, argyrol 10 to 25 per cent., also silver nitrate 1 per cent. Of these, collargol has been more frequently used than the rest and more successfully. Kelly and Lewis, in their recent advocacy of silver iodide, claim that it casts shadows equally as good and is non-irritating and not dirty, the latter being the chief disadvantage of collargol. Silver iodide is also less expensive. There has been a great deal of discussion about the irritation of collargol. Many claim that the pain following pyelography is due to the drug. It seems clearly settled that such is not the case; that the pain is a distention pain. Shall we endeavor to cause pain in distending the renal pelvis for pyelography? This point is offering considerable debate. In most of the articles which we read the authors say that pain is the chief index of a full pelvis, and advise waiting for this symptom before making the plate. Others claim that this is exactly what is not desired and are using devices, such as safety valves for overflow to prevent it.

A point which seems to be unsettled is the treatment of the pelvis after pyelography. Voelcker advises lavage of the pelvis with boric solution after draining off the excess of collargol. Légeu and Papin consider this illogical, for they think he has removed an excellent antiseptic that is more proficient than the boric solution, which is only slightly irritating. Legueu, Braasch and others advise siphoning off the collargol after injection. Spitzer and Childs do not believe in this procedure.

The Normal Pelvis.—There seems to be such a wide degree of variation of an accepted normal pelvis that no two men are agreed as to the exact line between the normal and the abnormal. Size within reasonable limits is not an absolute criterion. Childs and Spitzer give from 4 to 15 c.cm., others higher. Cabot thinks the

most important factor in determining a normal pelvis is the relation of the pelvis to the upper ureter. Braasch believes that the changes in the calyces form the most important means of differentiation. Fowler considers the relation of the pelvis in the horizontal and upright position to be of importance, while Childs and Spitzer find such variations in normal cases that they attach no importance to it. The latter believe that one of the most important early signs which help us in our determination is the change in the lower pelvic wall which normally should be concave and which in early involvement is convex. In various diseases of the kidney pyelography is an unestimable aid. It finds its greatest field of usefulness in determining early hydronephroses, and in late hydronephroses to enable us to ascertain before hand, in case of a plastic operation, where to make the anastomosis, and also in congenital, misplaced and ectopic kidneys. It is of value also in many cases of renal tumor, stone, tuberculosis (according to Braasch and Legueu), and also of value in differentiating between intra- and extrarenal changes.

Accidents During Pyelography.—Braasch in 1,000 cases has noticed no serious accidents following pyelography. Some of the ill effects which have been reported following pyelography are pain, infiltration of the material injected, fever, suppression of urine, argyria and death.

Pain.—Pain, to a very slight extent, which is usually of a dull, aching character, occurs in the great majority of pyelographic cases. As was stated before, some men rely on pain as their index to a full pelvis in order to get a good picture. Others condemn it. As a rule, the pain quickly subsides leaving only a very slight discomfort. Renal colic has been reported by a few observers, but it has always followed forcible injection with the syringe. By the gravity method it is rare.

Fever.—There may be a slight raise in temperature following pyelography. Many authors say that there usually is. The fever usually lasts about forty-eight hours and is generally slight. Fevers persisting and running higher are usually infections following faulty technique. An accident which has been brought forward recently and to which attention was first called by Tennant, of Denver, is infiltration of the material injected into the renal tubules and in some cases through the kidney into the perirenal tissues. This author shows photographs of kidneys injected, showing the material out into the cortex. Legueu shows the same thing, and many other authors have reported similar consequences.

At the meeting of the American Medical Association in June, several men reported such an accident. One surgeon reported a ruptured kidney, another had seen a perinephritic abscess. They were all due to the syringe method with too much pressure. Axel Key believes that the forcible compression of the abdomen with a radiograph tube is responsible for most of these complications. It is on account of these unfortunate circumstances that Blum considers it as an unsafe procedure. The infiltration of the material into the renal tubules, in the majority of cases, has caused no serious complications. The urine shows evidences of a mild nephritis which in fact usually clears up. There have been a few deaths following pyelography. One of the first was due to an acute argyria reported by Rossel, of Munich. This woman died eight hours after the injection. The author states that patient had evidently absorbed from an inflammatory pelvis.

DIAGNOSTIC AND THERAPEUTIC NOTES.

TREATMENT OF PROGRESSIVE PARALYSIS.—Pilcz (*Muench. med. Wochenschr.*, No. 40, 1913). Ever since it has been noted that paretics often improve after intercurrent febrile affections, the attempt has been repeatedly made to use therapeutically substances that induce fever and leucocytosis. And, indeed, long continued remissions have so been obtained, much longer than those that occur spontaneously. Mercury and salvarsan alone are of little avail and, indeed, often do harm, but a combination of the specific therapy with this newer one may produce good results.

Pilcz gives a daily injection alternately of tuberculin and of mercury succinamide. The former is given in increasing doses, beginning with 5 mgrm., until 1.0 grm. has been used; of the latter, 0.02 grm. is given each time. Instead of the tuberculin, killed cultures of staphylococci or streptococci, or a solution of sodium nucleinate may be used; the mercury may be replaced by salvarsan.

THE CAVIBLEN TREATMENT OF GONORRHEA.—Bruck, Sommer, Glueck (*Deutsch. med. Wochenschr.*, No. 43, 1913). An important contribution to the treatment of gonorrhea comes from Neisser's clinic. One of his assistants, Bruck, has devised a 40 per cent. combination of silver with the stain uranin, which is said to surpass at once in effectiveness and in lack of irritating properties all other preparations. Uranoblen as it is called is a reddish-brown powder and is used in the form of bougies to which the name caviblen rods (*Caviblenstaebchen*) has been given. They are prepared in two lengths, for anterior and posterior urethritis, and in several strengths. They are used just like the well-known protargol bougies and, if the writers' statements are to be credited, mark a new era in the treatment of gonorrhea. For the details of their use, the reader must be referred to the original article.

A NEW TREATMENT OF HYPERACIDITY.—Glæssner (*Wien. klin. Wochenschr.*, No. 39, 1913). Small amounts of biliary acids, introduced into the stomach, are able considerably to depress the secretion both of pepsin and of hydrochloric acid. In this way, the pains of gastric ulcer or erosions may be controlled unless the ulcer be much indurated or penetrating. The good effect, in the author's experience, usually persists even after the treatment is discontinued. It is successful if the ulceration is accompanied by hyperacidity or normal acidity, but not in the presence of a sub-acidity or anacidity. He administers 0.5 to 0.6 grm. cholic acid daily, a dose which is never productive of ill results.

PROTECTION OF THE HANDS AGAINST BACTERIAL CONTAMINATION.—Bruening (*Muench. med. Wochenschr.*, No. 31, 1913). In handling infected cases, rubber gloves afford a very uncertain protection to the hands of the operator. They are easily torn or cut, and, once the hands are infected with virulent micro-organisms, they are rendered positively sterile with much difficulty. On the basis of careful bacteriological tests, the writer advocates the use of vaseline instead of gloves in these cases. The hands are thoroughly scrubbed with a bit of borated vaseline about the size of a hazel nut. If the proper quantity is used the hands are completely anointed without being rendered slippery. If they then become infected, the contaminating material can be completely removed by washing with hot water. In an emergency, the vaseline may be replaced by butter or lard.

MASTURBATION IN GIRLS.—Kaufman (*New York Med. Journ.*, October 18th, 1913). Masturbation is the source of many of the commoner ailments of childhood. It is apparently more frequent among girls than boys. The practice of nocturnal masturbation among girls may be detected by means of the following ruse:—

Take a specimen of urine and examine it microscopically to determine the absence of yeast. Have the mother prepare some yeast and make the child play with it at night time just before it is put to bed. It is better to have the yeast fairly moist at first, as it then cakes better on the hands. Then, without allowing the child to wash her hands, put her to bed. An examination of the urine the next morning will, in cases of masturbation, show the presence of the yeast fungus.

A NEW IODINE OR INDICAN TEST.—Jolles (*Berl. klin. Wochenschr.*, No. 41, 1913). To 10 c.cm. urine add an equal amount of concentrated hydrochloric acid and 2 c.cm. of a 10 per cent. solution of cupric sulphate. Both iodine, if present, and indican are set free. Shake the mixture with 2 c.cm. chloroform. If iodine be present, the chloroform will take on a typical violet color, which disappears on adding a sodium hydrate solution. In the presence of a considerable amount of indican, the chloroform takes on an indigo-blue color.

TREATMENT OF GANGLION.—Pakowski (*Prog. Méd.*, No. 10, 1913). The old method of Duplay deserves to be revised. By means of a hypodermic, 2 or 3 drops of tincture of iodine are injected into the ganglion and moderate compression made by means of a bandage. If the ganglion has not disappeared in the course of four or five days, the procedure is repeated. More than three injections are never required. The injections are not followed by pain.

DIAGNOSIS OF LARGE ABDOMINAL CYSTS.—Glæssner (*Wien. klin. Rundschau*, No. 38, 1913). If the stomach is inflated, in the presence of a large intra-abdominal neoplasm, a very characteristic furrow will make its appearance between the greater curvature and the wall of the cyst. This furrow moves with respiration.

CORRESPONDENCE

LONDON LETTER.

By F. G. CROOKSHANK, M. D. Lond., M. R. C. P.

A few weeks ago, or, to speak by the card, on November 8th, 1913, there appeared in the *British Medical Journal*, written by Mr. W. G. Richardson, of Newcastle-on-Tyne, an account of a case that is, I think, deserving of some little attention. Mr. Richardson, who is Surgeon to the Royal Infirmary at Newcastle, has since furnished some fuller details to a local pathological society, and I am glad to have had the opportunity of reading his notes.

Briefly, the story is this. A man, aged forty-seven, was, on October 5th, 1913, operated on, some seven hours after the rupture of a duodenal ulcer, by Mr. Richardson who had noticed, when he first saw the patient half an hour before operating, that the abdomen had not the board-like rigidity usually seen, but was indeed somewhat lax. Moreover, the respiration was mainly abdominal—also against the rule—and the pupils were widely dilated.

However, morphia and atropine were administered, and laparotomy was performed, in the customary way, under general anesthesia. But in spite of the morphia, the pupils continued in a state of dilatation, and the abdominal character of the respiration became even more marked as the operation proceeded, the patient remaining, as is said, of a 'bad color.'

When first the incision had been made, the stomach was found to be empty, small and lax, the duodenum and other parts of the intestine were not distended, and the whole abdomen was 'flat.' But, when the operation had been nearly completed, and about two-thirds of the peritoneal wound had been sutured, it was seen that the upper part of the abdomen was becoming distended. In less than half a minute later, the stomach had so bulged into the wound that the suture had to be unlaced; and the viscus 'became drum-like and very tense.' To quote Mr. Richardson's own words "it appeared to be anchored at the pyloric and the cardiac extremities, because, as the distension increased, it rolled upwards, bringing the greater curvature forwards." The veins of the stomach became very prominent and enlarged; and then a stomach tube was passed by mouth, when, with an immediate rush of gas, the distension disappeared, the stomach becoming firmly contracted. The contraction of the stomach is reported to have been extreme, and without peristaltic waves; but it is also said that the organ contracted in sections, with alternating 'rings' of ischemia and of natural color. By this time the venous engorgement had disappeared, and the respiration had become, for the first time, really quiet, and wholly thoracic; the

pupils also having contracted, and the whole aspect changed for the better.

The affair only lasted somewhat less than five minutes, and the subsequent progress towards recovery was both happy and expeditious.

Now, several points of no little interest are raised by the consideration of this most careful report. That of most concern to myself is the pretty clear proof, I think, afforded that, in at least some cases of acute gaseous distension of the stomach, the gas is not the result of fermentation; not the result of air-swallowing; not consequent to the passage of flatus backwards through the pylorus, but due, indeed, to actual diffusion of gas from the vessels in the stomach walls—a thesis that I tried to defend, in a little book, published last year, entitled “Flatulence and Shock,” and reviewed in the JOURNAL. This notion of the actual secretion of gas from the stomach walls is, of course, not new; for it was upheld by Trousseau and Graves, and in recent years has been supported at least by two of your citizens—Drs. Woodgate and Graham, whose papers I am anxious to procure, if they are still obtainable. Yet it is a notion that has been obstinately ignored by many who refuse to observe what actually occurs, so long as it is inconsistent with orthodox physiological dogma.

What are the actual facts of this case? As Mr. Richardson says, until the distension suddenly set in, the stomach was collapsed and empty. Moreover, the distension, when it did occur, was limited to the stomach itself. Therefore, the gas was not brought in from the intestine. Could the distension have been due to aerophagy? Mr. Richardson says: “No, for movements of deglutition were not seen to occur, although they were carefully looked for.”

Could the gas have been imprisoned in the esophagus during the earlier part of the operation, and then suddenly propelled into the stomach? Well, Mr. Richardson avers that the stomach, at its moment of maximum distension, was so big as a Rugby football, or, shall I say, as a fair-sized pumpkin.

Surely the only credible hypothesis, and moreover the only one that explains the facts, is that the gas was really given off into the lumen of the stomach, just, as, according to Crile, is gas given off from the peritoneal surface of the intestines when laparotomy is performed experimentally under certain circumstances.

In support of this hypothesis of ‘air-secretion’ Mr. Richardson alludes to a common, yet little-noted occurrence. When during a gastro-enterostomy portions of the stomach or of the jejunum are isolated by the use of long clamps, it often happens that the surgeon has occasion shortly after the first application of his clamps to remove and readjust them, owing to distension of the isolated portion of the alimentary canal with gas. Is not this distension due to the actual production of gas, within the cavity of the isolated portion, otherwise than by fermentation?

Mr. Richardson, in his paper, suggests, and not without good reason, I am sure, that the dilatation of the pupils and the unusual type of respiration may have been correlated features indicative of the whole symptom-group having been due to some derangement of certain medullary centres. For myself, I should be inclined to speculate that the cause of any such medullary disturbance must have lain in some variation in the gaseous content of the blood; for there are many facts which tend to bring the consideration of these

cases of acute distension of the stomach by gas into the same province as that to which the elucidation of acapnia should be referred. However this may be, there are several other points that should not escape notice: First, that while the stomach was distended there was evident spasm of the pylorus and of the cardia, a fact grateful to those who may agree with some of my suggestions in the essays already referred to; and secondly, that the precedent venous engorgement points fairly definitely to a vasomotor implication also suggested by the consecutive happening of a curious kind of functional dissociation of the stomach-wall into 'rings' in which alternate and opposite vasomotor states prevailed.

A complete discussion of all the bearings of this interesting case would lead us too far afield; but it may be hoped that those who have the opportunity of witnessing similar occurrences will examine and report them as carefully as Mr. Richardson has done, and that, above all, should the chance happen they will, if a stomach tube be passed, take pains to capture in a bag the expelled gas, and convey it to a competent analyst for examination!

January 10th.

PRACTICAL MEMORANDA.

By WM. T. COUGHLIN, M. D., of St. Louis.

The value of the cutaneous tuberculin reaction is a question which still continues to attract attention. There are cases of active tuberculosis in which the reaction is negative; these are usually subjects in whom tuberculosis is well advanced and progressing rapidly, the system of the patient being so weakened by the absorbed toxins that no strength remains for a reaction at the site where a slight additional amount of toxin is exhibited. A strong reaction means, as a rule, that the subject is making a defense against active tubercle somewhere in his system. It does not mean, however, that the condition for which the patient presents himself is tuberculous. It is not unusual for a patient in whom the reaction has been positive to show a negative reaction during some severe acute infection. This has been observed both in children and in adults during measles, typhoid, bronchopneumonia, scarlatina, diphtheria, erysipelas and rheumatic fever. It has even been noted in pregnancy. Such disappearance of the reaction is not to be taken as a matter of grave import, but its non-disappearance may be considered a good omen. Like many other diagnostic signs taken by itself, a positive cutaneous reaction has not very great value. In infants and young children a positive cuti-reaction in the presence of chronic inflammatory swellings is of value, because in these there is not so likely to be or to have been active tubercle in the lungs or bronchial glands, and as a negative sign both in children and adults, with the exceptions above noted, it is of positive value.

After operations on the female perineum it is generally necessary to catheterize during the first few days. This is, of course, something that must be attended to by the nurse, and it may be that the nurse has not had much experience in catheterizing patients of the kind. At any rate, even be she ever so skilful or careful, infection of the bladder or of the wound or of both is liable to occur. To avoid such sequelæ it is a good plan slightly to dilate the urethra and lay in a retention catheter. In addition to this (and especially is it of value if a leucorrhœa has existed) one may protect the wound during the first two or three days by smearing the suture line with Beck's paste, and then laying a piece of gauze incorporated with the same in the vagina and allowing it to protrude and fall backward over the suture line. After three days the danger of infection is practically over, and then both catheter and gauze may be removed. We have often used Whitehead's varnish instead of Beck's paste, but the latter is more easily prepared and less expensive and works just as well. While we know that the best way

to avoid infection is to exercise cleanliness and avoid unnecessary injury to the tissues and secure perfect hemostasis, we believe that the addition of the above measures is valuable.

After operation of almost any kind in which an anesthetic is used, but above all after operations on the abdominal viscera, a patient is likely to suffer from distension with gas. This is often annoying to the patient and it may be dangerous, and it is perplexing to the surgeon. Give no morphine at all if you can avoid it, but do not give any after the first twenty-four hours. Postoperative pain can often be relieved by asperin or by a combination of asperin, phenacetin and caffeine, and these can nearly always be retained after the first twenty-four hours. At the end of twenty-four hours a soap-sud enema may be given. If this be repeated every three hours it is likely that gas will begin to pass freely after the third or fourth enema. We have found this to work better and to be less dangerous than either physostigmine hypodermically or assafœtida or alum enemata. In stubborn cases thirty drops of turpentine may be added to the soap-suds, but it should be used with caution because of its effect on kidneys perhaps already doing their utmost.

Postoperative retention of urine in males after operations on the genito-urinary tract can be relieved by inserting a small piece of ice in the rectum or by the deep instillation of a few drops of a five-grain silver solution which will make any patient urinate very promptly.

One would think that the contact of ether with the peritoneum would be almost sufficient to provoke a peritonitis, and yet various French surgeons are reporting cases of advanced general peritonitis cured by mopping the inflamed peritoneum with ether, and even going so far as to pour into the peritoneal cavity and leave there varying quantities up to a litre.

Bloch and Verne, after examining the spinal fluid of a large number of cases, are of the opinion that we are wrong in regarding two to three lymphocytes per cubic millimetre as the normal number. According to them, even one to three per cubic millimetre indicates an inflammatory reaction. They do not state what they regard as the normal number.

Pindborg has confirmed the finding of Roger that the amount of albumin present in the sputum of tuberculous subjects varies directly with the activity of the disease. The average amount present in the sputum of those in the third stage was 2.5 parts per thousand in afebrile cases and 4.3 parts per thousand in the febrile. An intercurrent fever was without effect on the amount present in the afebrile cases.

Carle, of Lyons, after a study of 2,000 cases concludes that the ordinary complications and sequelæ of gonorrhœal urethritis are at least five times more frequent in the cases treated without injections of any kind, the single excepted complication being peri-urethritis which is more common after the so-called abortive treatment. The abortive treatment he regards as improper.

BOOK REVIEWS.

CYCLOPEDIA OF AMERICAN MEDICAL BIOGRAPHY. Comprising the Lives of Eminent Deceased Physicians and Surgeons. From 1610 to 1910. By Howard A. Kelly, M. D., Professor of Gynecologic Surgery at Johns Hopkins University, Baltimore. Illustrated with Portraits. Two Octavo volumes averaging 525 pages each. Philadelphia and London: W. B. Saunders Company. 1912. Price, per set: Cloth, \$10.00; Half Morocco, \$13.00.

There will always be those who will criticize in no friendly way books bearing on encyclopedic subjects, for no matter how thorough the author, mention of some more or less distinguished individual will necessarily be overlooked. But when offering this criticism, the reader, or rather the critic of preconceived opinions, should be lenient and remember the enormous amount of work entailed in getting up this sort of work. Now it has been stated in a number of medical journals that Dr. Kelly should have mentioned this person or that in so comprehensive a book as his, and that either he was ill advised or through sheer negligence failed to do so. Perhaps the oversight, so greatly lamented, is a defect if one expects perfection in an encyclopedia; but has not this same charge been brought against other works of this nature, and just why should perfection be demanded in these instances when in other writings—and reference is here made to books on general subjects—slight defects are overlooked? But even granting that the captious critic is right in his estimate of Dr. Kelly's work, let us leave him to his narrow thoughts and judge without prejudice the value and worth of the two volumes. In each instance the biography is well written and has just those bits of information which every student must desire who is not enamored of indirectness of speech. But this is not all, for on every page the careful editorship is apparent, and this in itself constitutes an asset in a book of this sort that cannot be overestimated. Who has not turned away in disgust from encyclopedias of considerable fame because the editors did their work as raw apprentices and not as scholars; and who has not been a bit indignant that such works are to be found on the library tables of supposedly well-informed physicians and laymen! Now let us say at once that the physician who acquires Dr. Kelly's work need have no such fear, for the scholarship of the editor is warrant enough that the correctness of statements cannot be disputed, that the style of writing is not the usual dryasdust sort altogether too frequent in books written or edited by medical men, and that the reader, no matter how critical, is going to get some knowledge in a dress that will prove interesting. If space permitted we would quote some of the clever anecdotes related and those other points in the writing of biographical sketches, which inform the reader in what manner the subject of the sketch either affected the times in which he lived or was affected by them. But, even were we to lift these out of the text, scant justice would be done this work, which to be fully appreciated must not be skimmed over but be used as a reference book, time and again, by all those who are interested in any great or small Pharos in the history of American medicine.

THE AMERICAN ILLUSTRATED MEDICAL DICTIONARY. A New and Complete Dictionary of the Terms Used in Medicine, Surgery, Dentistry, Pharmacy, Chemistry, Nursing, Veterinary Science, Biology, Medical Biography, etc., with the Pronunciation, Derivation, and Definition. Including Much Collateral Information of an Encyclopedic Character. By W. A. Newman Dorland, A. M., M. D., Member of Committee on Nomenclature and Classification of Diseases, of the American Medical Association, Professor of Obstetrics, Loyola University, Chicago, etc. Seventh Edition, Revised and Enlarged. Philadelphia and London: W. B. Saunders Company. 1913. Price, \$4.50.

The seventh edition of Dorland's "American Illustrated Medical Dictionary" is of such excellence that to cavil at any minor slips would indeed be declarative of a mind that attaches too much importance to insignificant matters. No dictionary, be it said here, can please everybody, since every student of a

language has his own predilections as regards spelling and pronunciation; but, though this be a fact, it should weigh but lightly in any estimate of a lexicon, for the all-important matter which should engage our attention is whether the work is serviceable to the majority. Now without laying ourselves open to the charge of over-praise, it can be stated in all fairness that the book under consideration is of such thorough workmanship and of so high a degree of completeness that no student of medicine can go far astray were he to follow its etymology or quote from the really excellent definitions. But though we graciously concede all this, why is it, may we be permitted to ask here, that the word 'leucocyte' is spelt 'leukocyte'? Perhaps it is habit, perhaps it is our faulty education, but for quite a number of years we have spelt the word in the former way and have accustomed our eye to it in our readings in the recognized English medical journals. Moreover, the latest edition of the "Century Dictionary," Hoblyn's Dictionary of Medical Terms (fifteenth edition), "The Oxford Dictionary," and Stedman's "Medical Dictionary" spell it with two c's, and surely they are no mean authorities. Of course, this is a minor matter to be decided by the Hellenists who make much of our retaining the Greek derivatives in the English language, but it must be granted that a uniformity in the matter of spelling this word would do much to add to the peace of mind of him who wishes to write correct medical English. Now though we could go on in this wise and pick flaws here and there, we refrain lest we might be thought too fastidious opposite a work that has all the earmarks of having been prepared with a scholarship that is not so often characteristic of medical dictionaries that it should not come in for a high degree of praise.

WHAT TO EAT AND WHY. By G. Carroll Smith, M. D., Boston, Mass. Philadelphia and London: W. B. Saunders Company. Price, \$2.50.

If we were asked to recommend a book that contains the sanest advice to all food faddists, we would without hesitancy mention Dr. Smith's book, for throughout it there is repeatedly shown that the author's mind is of a decidedly normal calibre, and that having heard so very much on the subject of what one ought or ought not to eat he knows how to squelch the really ridiculous theories that have been put forth, not only by laymen, but by supposedly well-informed medical men. In nearly all the books on this subject, which have lately come to our desk, there has been a tendency on the part of the authors to drift too readily into the rôle of food faddist; and though the books had some points worth while, the reviewer soon lost all interest in them on account of this defect. That it is easy to be lured into this pitfall can readily be understood; but even so, should one be lenient in judging this weakness? We do not think so, since, especially when writing on this subject, sanity should be paramount.

If the reader will read the Introduction to this book carefully, he will soon see why we are prejudiced for it, and if he will read farther on he will see that throughout the author sustains his clarity of seeing and estimating matters in a manner that must appear true to all lovers of cool judgment, calm decisions and an understandingness of the verities. The diseases and the special diets which should be given make up the greater part of the book, and these chapters distinctively show that the author does not believe in narrowing down the amount of food to be given to infinitesimal proportions so that his patients may think him scientific! How often this is done even by well-meaning physicians need not be recorded here; but what should be recorded is that all physicians, who are a bit tired of hearing medical food faddists expatiate on their pet theories, cannot do better, if they wish to forget these tiresome talks and get into a clearer and saner atmosphere, than to purchase this exceptionally interesting book by Dr. Smith.

DISEASES OF THE STOMACH, INTESTINES AND PANCREAS. By Robert Coleman Kemp, M. D., Professor of Gastro-Intestinal Diseases in the New York School of Clinical Medicine, etc. etc. With 388 Illustrations, Some in Colors. Second Edition, Revised and Enlarged. Philadelphia: W. B. Saunders Company. 1912. Price, Cloth: \$6.50; Half Morocco: \$8.00.

The above is the second edition of the author's work on "Diseases of the Stomach, Intestines and Pancreas," already accepted as a most advanced work upon these subjects. A few unimportant errors found in the first edition have been entirely excluded from the present one. New additions, particularly worthy of mention, are the chapters on Colon Bacillus Infection and Diseases of the Pancreas. The section on Duodenal Ulcer has been very greatly improved by an entire revision. For physicians who have no time or opportunity to go through the clinical course on the new mass of material,

which has been elaborated upon these subjects, this book furnishes a working knowledge by means of the most practical methods. It takes up all the means of diagnosis to the minutest detail. Almost every test that has ever been used with any proficiency is herein described so as to be available to the reader. Every part of the technique even of the simplest procedures in laboratory work, physical or special examination, or instrumentation of these organs is carefully given so as to place them at the command of any practitioner. Nothing is left to be surmised or no details are considered unimportant enough to be omitted. The book contains probably one of the best and most modern discussions on Diverticulitis and Typhoid Fever, particularly from the standpoint of differential diagnosis. It abounds with charts, illustrations, x-rays, photographs, skiagraphs, cuts of apparatus, instruments, etc., making it, all in all, a very serviceable book for the general practitioner, as well as for those engaged in work on the gastro-intestinal tract.

SURGERY AND DISEASES OF THE MOUTH AND JAWS. A Practical Treatise on the Surgery and Diseases of the Mouth and Allied Structures. By Vilray Papin Blair, A. M., M. D., Professor of Oral Surgery in the Washington University Dental School, and Associate in Surgery in the Washington University Medical School. With 384 Illustrations. St. Louis: C. V. Mosby Company. 1912. Price, \$5.00.

Dr. Blair's peculiar fitness for writing this book is well recognized, and he has made this work a record of his large experience. In the development of the special subjects, certain general surgical problems have been emphasized, which have made it seem proper to introduce chapters on shock and surgical technique which add distinctly to the value of the book. The scope of the work and the thoroughness of treatment are particularly noticed in the sections on cleft lip and palate, which cover the anatomy, theories of causation, various operations for relief and the after-care.

One finds in this work complete anatomical and surgical discussions of subjects that are usually not fully treated in general surgery. Particularly is the work valuable, as it makes available for surgeons certain dental knowledge that is most likely to be disregarded when treating oral conditions, except when complications arise that demand a dental consultant. There are excellent chapters on deformities of the jaw and diseases of the temporomandibular joints, which represents work that is almost entirely original and most valuable. There are also chapters covering cancer of the lip and tongue, affections of the salivary gland, infections about the face and mouth. The fifth nerve disturbances are considered, and various minor and major methods of relief given in full. Throughout, the work is well illustrated.

A MANUAL OF SURGICAL TREATMENT. By Sir W. Watson Cheyne, Bart., C. B., D. Sc., LL. D., F. R. C. S., F. R. S., Hon. Surgeon in Ordinary to H. M. the King, etc. and F. F. Burghard, M. S. (Lond.), F. R. C. S., Surgeon to King's College Hospital, etc. New Edition. Entirely revised and largely rewritten with the Assistance of T. P. Legge, M. S. (Lond.), F. R. C. S., Surgeon to the Royal Free Hospital, etc. and Arthur Edmunds, M. S. (Lond.), F. R. C. S., Surgeon to the Great Northern Central Hospital, etc. In Five Volumes. Vols. III, IV, V. Philadelphia: Lea and Febiger. 1913.

We have already considered the first two volumes of this work. The last three continue the high standard set by the others, and throughout one is impressed with the improvement over the first edition of the work. One feature that impresses is the clear and detailed way the major operations are described, thus bringing forward the things most operators will most appreciate; but no part of surgical treatment is neglected, even though all is not so thoroughly considered. We find in these volumes another evidence of the fact that major surgery is the same in all clinics; it is in the minutiae that they differ; and in this work we have exemplified the best of London surgery, as the authors only describe such methods as they themselves use and give little time to discussion of others.

A TEXTBOOK OF HISTOLOGY. By Frederick R. Bailey, A. M., M. D. Fourth Revised Edition, Profusely Illustrated. New York: William Wood and Company. 1913. Price, \$3.50.

This well-known book on histology has now reached its fourth edition. The present volume contains considerable new matter and many new illustrations. The book opens with a short chapter on technique in which the subject-matter is well selected. In the body of the book a logical order is followed. First, the cell is dealt with, then the tissues, and finally the organs. The chapter

on the nervous system includes over a hundred pages, and is written by Dr. Oliver S. Strong.

As usual in textbooks on histology the practical importance of organs, as far as medicine and surgery are concerned, is not taken into account by the author. Notwithstanding the great amount of work done recently on the ductless glands, the whole group gets only a dozen pages. The thyroid, including its development, a large-sized picture and a space for a chapter heading, is described in two pages. There is less than a page of actual text devoted to the vermiform appendix.

The book is well printed on good paper and neatly bound. The illustrations, while not of the highest order, will answer the purpose of enlightening the reader.

THE FLEA. By Harold Russell, B. A., F. Z. S., M. B. O. U., with Nine Illustrations. New York: G. P. Putnam's Sons. 1913. Price, \$0.40.

Even the author suggests that the title of this book might admit of facetious remark, for somehow the flea is always a subject for joke. That this insect should be taken seriously however, we all know, since we have found that it is the active agent in spreading plague. Rats are subject to infection by bacillus pestis, and rat-fleas are infected by feeding on the blood of these rats. It has been shown that these fleas may remain infective as long as fifteen days.

This book completely exhausts our knowledge regarding the flea in every particular. There are several chapters on the anatomy of the insect. Chigoes and their allies have a chapter. Rat-fleas and bat-fleas are considered as well as human fleas. In the appendix we find a systematic view of the order, a list of British fleas, a bibliography, and directions for collecting and preserving fleas. Incidentally in glancing over the pages we learn that monkeys have no fleas (a bitter disappointment), and that performing fleas are not possessed of the almost human intelligence with which we have been inclined to credit them.

RADIUM AS EMPLOYED IN THE TREATMENT OF CANCER, ANGIOMATA, KELOIDS, LOCAL TUBERCULOSIS AND OTHER AFFECTIONS. By Louis Wickham, M. V. O., Médecin de St. Lazare, Ex-Chef de Clinique a l'Hôpital St. Louis, and Paul Degrais, Ex-Chef de Laboratoire a l'Hôpital St. Louis, Chefs de Service au Laboratoire Biologique du Radium. With Fifty-three Illustrations. New York: Paul B. Hoeber. 1913. Price, \$1.25.

Few subjects of interest to laymen and physicians have attracted such attention as radiumtherapy. The world's supply of radio-active substance cannot hope to balance for years to come the ambitions of physicians to apply radiumtherapy nor the anxiety of sufferers to submit to its possible beneficence. This little book by the organizers of the first experimental laboratory is of great argumentative value and provides the conservative estimate of radiotherapeutics which we expect from authorities of world-wide reputation. Many of the illustrations are recognized because of their appearance in the larger textbooks of Wickham and Degrais. This book is just what its authors mean it to be,—a brief résumé for physician and layman of the rational, conservative use of radium and its emanations—and as such it can be heartily recommended.

BEBERIBI. By Edward B. Vedder, A. M., M. D., Captain Medical Corps, U. S. Army, etc. The Cartwright Prize of the Alumni of the College of Physicians and Surgeons, Medical Department of Columbia University, New York, for 1913, and published by permission of the Surgeon-General of U. S. Army. Illustrated by Numerous Engravings and by Five Colored Plates. New York: William Wood and Company. 1913. Price, \$4.00.

Berberi now definitely belongs to the group of preventable diseases. All the evidence goes to show that it is due to a too exclusive use of highly polished rice as food. The outer layers of the rice-kernel contain food elements of vital importance, the removal of which from the rice renders the latter toxic. No one can read Vedder's book without being convinced by the evidence he marshals in support of this view.

The abolition of the disease is simple in principle, however difficult it may be in practice. Two ways are open. A campaign of education may be inaugurated to induce the natives to call for under-milled instead of polished rice; or, by an international agreement, the rice-producing nations may improve a prohibitory tax on highly polished rice. The writer strongly advocates the latter method.

TUMORS OF THE JAW. By Charles Locke Scudder, M. D., Surgeon to the Massachusetts General Hospital; Lecturer on Surgery in the Harvard Medical School, etc. etc. With 353 Illustrations, 6 in Color. Philadelphia and London: W. B. Saunders Company. 1912. Price, Cloth, \$6.00; Half Morocco, \$7.50.

The author has presented the most complete study of jaw tumors, and has most interestingly accomplished what he states in his preface as his purpose, "to assist the physician in determining in a given case what form of new growth is present and what is its best treatment" and "to make vivid the picture of each tumor of the jaw by statistical story and by case history." This monograph by Scudder covers all the available knowledge in the literature, and more particularly presents the results and the experiences with the clinical material of the Massachusetts General Hospital. This work adds knowledge to medicine and makes available to everyone an experience that few individuals can have. If our publishers would encourage the publication of such monographs, and if they were judicious in selecting such able men to present the work, medical literature would be a more attractive field to the medical reader.

CANCER OF THE BREAST. An Experience of a Series of Operations and Their Results. By Charles Barrett Lockwood, F. R. C. S. (Eng.), Consulting Surgeon to St. Bartholomew's Hospital, etc. etc. New York: Oxford University Press. 1913. Price, \$3.00.

This volume represents the story of cancer of the breast told by way of case reports, the case histories being so classified as to permit the author to group them under nine chapter heads, as follow: Clinical Data, Morbid Anatomy and Pathology, General Pathological Considerations, The Local Operation, Complete Operation, Recurrence, Operation for Recurrence, Results.

Unfortunately the method of presentation is not sufficiently didactic to render the volume particularly suitable for students, and yet not full enough to make a valuable reference handbook. The style of writing is so direct and of such brevity as regards the use of words that reading the book over any length of time becomes a strain, and yet withal, there is manifest the pronounced grip of the clinician who is equal to that supreme test—the presentation of facts without circumlocution.

A MANUAL OF PATHOLOGY. By Guthrie McConnell, M. D., Professor of Pathology and Bacteriology, Medical Department, Temple University; Assistant Pathologist to the Philadelphia City Hospital, etc. etc. Illustrated. Second Edition, Thoroughly Revised. Philadelphia and London: W. B. Saunders Company. 1911. Price, \$2.50.

The second edition of McConnell's "Manual of Pathology" has all the outstanding qualities of the first edition, and no doubt in its improved dress will meet with the cordial reception accorded the earlier issue. If we write that the additions to this edition are not of great importance it is not to belittle them, but rather to call attention to the fact that where a work has been so carefully written, it is almost impossible to improve. Still it must be said that the amplifying of the subject of malaria and other pathological subjects is not without value, and no doubt is an asset to be commended. But as has already been said, as the work originally stood it was of an excellence that cannot be greatly enhanced by a new edition.

MATERIA MEDICA, PHARMACOLOGY, THERAPEUTICS AND PRESCRIPTION WRITING. For Students and Practitioners. By Walter A. Bastedo, Ph. G., M. D., Associate in Pharmacology and Therapeutics at Columbia University, Assistant Attending Physician to St. Luke's Hospital, New York City, etc., etc. Illustrated. Philadelphia and London: W. B. Saunders Company. 1913. Price, \$3.50.

An excellent textbook for school use and one which the physician also may find valuable. The discussion of the action of digitalis is especially complete and up-to-date. So far as we know, this is the only textbook of pharmacology of which this statement can be made without reservation.

SURGICAL OPERATIONS WITH LOCAL ANESTHESIA. By Arthur E. Hertzler, M. D., Surgeon to the Halstead Hospital, Halstead, Kan., etc. etc. New York: Surgery Publishing Company. 1912. Price, \$2.00.

The object of the author of this book is merely to furnish "in convenient form the technique of some of the commoner operations that can be done under local anesthesia." This is admirably described and cannot but be of interest to every student of local anesthesia in surgical operations. The author has the

happy faculty of bringing before the reader the salient points of his subject in a manner that is both lucid and concise; and what with the ever-increasing interest in local anesthesia by all surgeons to-day, it can be stated at once that the book under consideration will teach even the surgeon versed in the art of local anesthesia a number of things that he may have overlooked in his busy moments.

The illustrations are uniformly excellent, and the description of the technique of the steps in most of the major operations is all that could be desired.

LABORATORY METHODS IN AGRICULTURAL BACTERIOLOGY. By F. Loehnis, Ph. D., Professor of Agricultural Bacteriology in the University of Leipzig, etc. Translated by William Stevenson, B. Sc., N. D. A., N. D. D., Lecturer on Agricultural Chemistry and Bacteriology to the University College of South Wales and Monmouthshire, Cardiff, etc., etc. And Revised by the Author. With Three Plates and Forty Figures in the Text. Philadelphia: J. B. Lippincott Company. 1913.

While this is a work which will appeal directly to but few physicians, it is most valuable to those whose special work leads them into the field of inspection of dairies and food products. The aid which bacteriology may lend to agriculture and its allied branches is just being appreciated. What the future of this development will mean and how closely it will approach the field of practical medicine are thoughts that cannot but impress one while perusing these pages.

THE SURGICAL CLINICS OF JOHN B. MURPHY, M. D., AT MERCY HOSPITAL, CHICAGO. Volume II, Number 5, October, 1913. Published Bi-Monthly. Philadelphia and London: W. B. Saunders Company. 1913. Price per year, \$8.00.

This volume of the "Clinics" presents the usual wealth of clinical material. In addition to an address on Cancer by Dr. W. L. Rodman, of Philadelphia, the volume presents case histories and operative comments on the following subjects: Inguinal Hernia, Appendicitis, General Peritonitis, Osteitis Fibrosa Cystica, Angioma of the Thigh, Sarcoma of the Thymus, Olecranon Bursa, Duodenal Ulcer, Ankylosis of the Knee, Idiopathic Dilatation of the Colon, Calculus of the Urinary Bladder, Cancer of the Tongue, Tuberculosis of the Tongue, Tumor of the Femur, Fecal Fistula and Tumor of the Axilla.

PRACTICAL CYSTOSCOPY AND THE DIAGNOSIS OF SURGICAL DISEASES OF THE KIDNEYS AND URINARY BLADDER. By Paul M. Pilcher, A. M., M. D., Consulting Surgeon to the Eastern Long Island Hospital; Late Surgeon to the German, Seney and Samaritan Hospitals of Brooklyn, N. Y., etc. etc. With 233 illustrations, 29 of them being in colors. Philadelphia and London: W. B. Saunders Company. 1911. Price, \$5.50.

Pilcher in his work on cystoscopy has, without a doubt, given us the most comprehensive work on this subject to date. He enters into a very good description of the history of cystoscopy, picturing and explaining many of the cystoscopes with their advantages and disadvantages. His photographs, both colored and plain, of various lesions are excellent. For one who desires to obtain some excellent cystoscopic ideas this book is highly recommended.

MANUAL OF OPERATIVE SURGERY. By John Fairbairn Binnie, A. M., C. M. (Aberdeen); Surgeon to the General Hospital, Kansas City, Mo.; Fellow of the American Surgical Association; Membre de la Société Internationale de Chirurgie. Fifth Edition, Revised and Enlarged; with 1,365 Illustrations, a number of which are printed in colors. Philadelphia: P. Blakiston's Son and Company. Price, \$7.00.

This volume gives as complete a working manual of surgical operations as it has been our opportunity to see. There are in many instances full indications for operation and aids to the selection of the type of operation demanded. While the text is concise, there is no abbreviation that confuses. The illustrations are well selected and numerous.

COLLECTED PAPERS BY THE STAFF OF ST. MARY'S HOSPITAL MAYO CLINIC, ROCHESTER, MINNESOTA. 1911. Philadelphia and London: W. B. Saunders Company. Price, \$5.00.

It is hardly necessary to review this volume, as the work is made up of papers presented at various societies and represents the activities in this line of the various departments of the clinic. Some of the papers are evidently 'fillers,' and few of them give anything essentially new. The most valuable

portions of the book are those papers that deal with operative technique, of which there are several. The book has some handsome illustrations. It is also convenient to have at hand the complete work of an institution, for reference.

SEXUAL IMPOTENCE. By Victor G. Vecki, M. D., Consulting Genito-Urinary Surgeon to the Mount Zion Hospital, San Francisco. Fourth Edition, Enlarged. Philadelphia and London: W. B. Saunders Company. 1912. Price, \$2.50.

Dr. Vecki has given the profession an excellent work. It is really surprising the amount of material he has concentrated into such a handy little book. He has gone quite thoroughly into the anatomy, physiology and pathology of the various forms of impotence.

It is indeed gratifying to read a book on this subject in which the author lays such important stress on the male genitals, since, in a large number of books on this subject, there is a desire to relegate all such conditions to the realm of neurasthenia.

GYNECOLOGICAL OPERATIONS. Including Non-Operative Treatment and Minor Gynecology. By Henri Hartmann, Professor of the Faculty of Medicine, Paris, etc. etc. Authorized Translation Under the Author's Supervision by Douglas W. Sibbald, M. B., Ch. B., Edin., Formerly Physician to the British Hospital, Levallois-Perret, Paris. With 422 Illustrations, a Number of Which are in Colors. Philadelphia: P. Blakiston's Son and Company. 1913. Price, \$7.00.

We had occasion to describe the many commendable features of this work on operative gynecology at the time of the appearance of the original in the French language. The English speaking profession is indeed indebted to the translator and publishers for an unusually valuable work.

CUNNINGHAM'S TEXTBOOK OF ANATOMY. Edited by Arthur Robinson, M. D., F. R. C. S. Ed., Professor of Anatomy, University of Edinburgh. Fourth Edition, Enlarged and Rewritten. Illustrated by 1124 Figures from Original Drawings, 637 of which are Printed in Colors, and Two Plates. New York: William Wood and Company. 1913. Price, \$6.50.

This fourth edition represents a full revision of every section, and a partial or complete rewriting of some of the sections. Many new illustrations have been added, and many of the old ones have been redrawn and recolored, so as to make them clearer. Throughout the volume, the Basle nomenclature is used.

A MANUAL OF INSTRUCTION IN THE PRINCIPLES OF PROMPT AID TO THE INJURED. Including a Chapter on Hygiene and Disinfection. Designed for Civil and Military Use. By Alvah H. Doty, M. D., Late Health Officer of the Port of New York, Late Major and Surgeon, Ninth Regiment, N. G. N. Y. Fifth Edition. New York: D. Appleton and Co. Price, \$1.50.

This fifth edition has been revised and brought to date. It is a valuable book to have in the hands of people who are away from skilled medical aid and must depend on proper and prompt aid from unskilled hands. It will also fill a need in the medical instruction of military men.

THE PRACTICE OF SURGERY. By James G. Mumford, M. D., Instructor in Surgery in the Harvard Medical School. Octavo of 1,015 pages, with 682 Illustrations. Philadelphia and London: W. B. Saunders Company. Price, \$7.00.

This is a treatise of surgery of great merit, and it has the advantage of being put forth in a way rather different from the stereotyped forms. It is a most readable book from the first article on appendicitis to the end of the volume, always giving the facts a more or less personal flavor and holding the interest throughout.

OBSTETRICS FOR NURSES. By Joseph B. DeLee, A. M., M. D., Professor of Obstetrics, Northwestern University Medical School, etc. etc. Fourth Edition, Thoroughly Revised. Philadelphia: W. B. Saunders Company. 1913. Price, \$2.50.

Deservedly this volume has become the standard textbook of obstetrics in training schools for nurses. Changes both in text and illustrations in this new edition reflect the latest advance in the science of obstetrics.

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EDITORIAL.

THE TUBERCULOSIS PROBLEM: FORMERLY AND NOW.

In one respect, and a striking one too, modern thought has invaded in rather brutal fashion a certain preserve in medicine that had all the earmarks of conservatism. It was thought, and perhaps is still thought by the old-fashioned members of the medical profession, that this special preserve was the best soil in which to plant seeds that would sprout into herbs, each one of which would be a panacea; and because the seeds did fructify and the growths were luxuriant the rustiness of the conservatism that made all this possible was overlooked. Who does not remember when it was a sacrilege to let fresh air into this preserve, when sunlight was excluded, when wholesome food was timidly encouraged and drugs were overestimated, when common sense was banished, nay ostracized as something unclean. Yes, indeed, that has been the history, lamely told here, of this special preserve, which all doctors thought must be guarded by a phalanx of their doughiest fighters or otherwise the curative powers of their drugs would be greatly lessened in their fight against tuberculosis.

But we have changed all this, and by 'we' the writer does not mean the medical drug enthusiasts, the stubborn adherents of a certain therapy, the shortsighted boosters of some marvelous cure, but that force in all walks of the life of to-day—modern thought. Say what we will about some of the advanced and exaggerated phases of this tendency, we must admit that it has broken down barriers, that it has ruthlessly seized conservatism by the nape of the neck and shaken it into a slight semblance of life, that it has been the means of uncovering old and easily accepted lies and routing them by the glare of common sense. And in no large or small province of literature, of science, or of medicine has it acted more effectively than in that of pulmonary tuberculosis, especially as regards the protection of the healthy.

Of course, modern thought in its triumphant demolition of the barriers that really stood on sand in the province of tuberculosis was greatly helped by modern medical science; but let us not concern ourselves here with the latter, for its efficiencies are well known. But what is not so well known is the decided change that has come over the medical mind in the last decade in regard to the sort of treatment, whose watchword is simplicity born of a judgment that has freed itself from those so-called scientific tethers which heretofore have prevented medical investigators from coming into their own as social philosophers,—instillers of common sense into mankind.

To emphasize the change of attitude all that is necessary is to note the insistence of the modern doctor on the importance of fresh air and sunshine. Several decades back, if not only one, the matter of fresh air did not have the importance it has to-day, and as for sunshine it was not even thought of by the many medical men who were earnest workers in attempting a 'cure' of tuberculosis. In fact, there was such a degree of resignation on the part of the medical man in his attitude,—that is in his attitude after the drugs, which were supposed to be empowered with virtues, failed him,—that his sick-room manner betokened he was face to face with the inevitable. He did not think of the enormous possibilities of fresh air, of sunshine, of good, wholesome food; in fact, he feared the former two and made light of the latter. He was a therapist born of a now wholly defunct school that got its sustenance from the efficacy of certain drugs which were undoubtedly of a high order. Where it made its great mistake was to imagine that all the drugs in the Pharmacopeia were just as efficacious as the few which could be counted on the fingers of one hand, and on realizing the gross error of such reasoning to wax sentimental and prate on the inevitableness of disease.

What sentimentalists we were, to be sure. Men of worth who could face the most harrowing scenes in the operating room, who could stand by the bedside of a patient and witness the futility of all their efforts, without so much as a quiver of the eyelid or an expression of disappointment at their failure, would talk in subdued tones of the consumptives whom they were attending; picture the hectic flush, the restlessness, the hope of getting well, the sad expression of the haunting eyes, in words that had the hush of mystery; and when their medical hearers were duly impressed, close their speech by saying that here was a disease of so baffling a nature, but withal so 'interesting,' that he who had the privilege of treating it was truly fortunate from a medical standpoint, for there was really nothing to do but watch its strange manifestations. And we younger men who thought ourselves fortunate to be present at these 'talks,' but who had never had a rich patient with this disease,—rich patients had a deeper hectic flush in those days, were

more interesting because they had so much more to live for than the poor,—what were not our hopes to see what our elders in the medical profession had seen not once but many times, and note just as they did that strange misunderstanding between a hopeless physical condition and a hopeful mental state! In those days we were still in the thrall of the fascinating heroine of “*La dame aux camélias*” (Camille), young and old still wept over that unfortunate lady’s tribulations, medical men marveled at the truth of the Dumas creation; and the world at large, whether medical or lay, was of the opinion that the moral shortcomings of the lady were completely overshadowed by her ‘interesting’ disease.

But at last the shackles of sentimentalism have been thrown off, and especially that form of tuberculosis, which is popularly called consumption, is no longer regarded merely as an ‘interesting’ disease, a sort of motion picture to draw tears from the laity and feigned sighs from medical men. A clearer, saner view of the disease itself and how it is disseminated is ours. By our modern propaganda we may have instilled a horror of it in the uncultured mind, we may have converted the old-fashioned sympathetic attitude into an attitude that is cold and distant by comparison on account of fear of contagion; but, even so, we have achieved this: a recognition of the disease on other lines beside those which engaged medical thought some years ago. And this is a great advance; so great that we of the present time, being so near the movement, cannot appreciate it at its full worth.

Thus can be seen without any great difficulty the good work that modern thought is effecting in the realm of medicine and especially in regard to preventable diseases. Just as Zola, the protagonist of this social movement, tore in brutal fashion the hypocritical mask off the middle classes and exposed their many failings, both moral and physical, so in the matter of consumption attempts are making daily, one might say, to show the disease just as it is, with all the sentimental frills and furbelows destroyed. That the death-rate has already been reduced we cannot say and remain truthful; but just because in the early stages of the crusade this is not recorded on the credit side of the ledger ought not to dampen our enthusiasm. And enthusiasm is what is required in this combat, for even though it reach heights that are too dazzling to appeal to those critics who are on a par with the lady who thought Turner’s sunsets unnatural because she had never seen them just as the painter had limned them, and the exploiters of the crusades are not continually working with both feet firmly rooted in the earth, it will nevertheless be the means of driving the disease into the open, there to be fought decently and with valiance, and no longer be kept tight closed behind barriers so that future sentimentalists of a literary turn or of a faulty medical education will have food for ‘copy’ or for ‘talks’ on the never-to-be-understood manifestations of a ‘strange and interesting’ disease.

P. S.

THE PRESENT STATUS OF TUBERCULOSIS.

A review of what has been accomplished by medical science in the year 1913, to diminish the ravages of tuberculosis, needs to be judicial—even frankly conservative in appreciation of heralded progress. The wish is father to the thought in medicine, as in all else human; and here, as often as elsewhere, we find results do not accord with prevision justified by seemingly well-studied facts. Workers of the most careful training and acknowledged genius of conception are striving constantly to reach a goal which the discoveries of Koch have shown to be possible of attainment. They, like others, may be, and often are, aroused by enthusiasm to announce tangible results, only later to realize a painful self-deception. Practically nothing of capital importance has been added to the anti-tuberculosis armament during the year 1913. In a general way the crusade has been conducted on the plan which some previous successes have consecrated.

We must still place in the front our inadequate measures of prevention—hygienic education, to limit occasion of infection and contagion; isolation and hygienic treatment; increase of individual power of resistance by elevation of the general standard of healthful living. Society, guided by the best medical thought, continues to enlarge and perfect these necessary arms, but they can never win the battle unaided. When an organic cause of disease is limited in its ravages to the human family, we may, in the light of experience, hope to limit, even to eradicate it for all practical purposes, but when it affects, with slight distinction, many forms of animal life, the effort at eradication can have only a temporary or terrestrially localized effect. Given the increasing commingling of humanity, social, national, racial; given the increasing dependence of humanity on animal food products, especially on animal milk at the age of greatest susceptibility to tuberculosis; and given the necessary imperfect application of all laws and measures of general prevention of tuberculosis, we must realize why science has thus far had to wage a war affording few trophies. Of the evidences of partial victories, of course, the most encouraging is the statistical revelation of a diminished death-rate from tuberculosis in the countries where hygienic laws have been made and intelligently enforced. Here we find reason enough to continue and increase the effort to educate the people.

Recent opinion emphasizes the importance of the digestive tract as a place for the reception of the tubercle bacillus where it finds many ways open for penetration of the organism. This view becomes still more important in the light of later studies of the human and bovine types of the bacillus. It has been shown that the bovine tubercle bacillus may cause any and all the lesions known to be possible to the human bacillus. Certain investigators have found

an association of the two forms in 11 per cent. of cases of all ages, with the bovine form found in the organs, never in the sputum; while in infantile cases the percentage of bovine tuberculosis rises to 29. If, often, tuberculosis in the adult be but the eclosion of an infantile infection, and that infection be possible through cow's milk, a promising field of prophylaxis lies before us.

The work on the biology of the bacillus has been carried to astonishing degrees of refinement, and affords valuable data, sometimes by negation; for the study of the granules of Much, which led to the conception that even dental caries was tuberculous and a possible source of infection of the organism, has shown that they are of very doubtful diagnostic value.

Work on tuberculous sputum has revealed a means of estimating the defensive power of the organism by measuring the phagocytic activity of the leucocytes found in the expectoration.

Efforts to find the bacillus by microscope in the circulating blood have afforded only doubtful results, and most observers prefer to prove its presence there by means of inoculation. The frequent occurrence of bacillemia as a terminal condition is explained as a phenomenon of allergy. This has led to the interesting conclusion that, as is frequently found, the presence of tubercle bacilli in various and many organs of the body does not prove that such organs are actually tuberculous, for they may harbor bacilli due only to the terminal allergic bacillemia. So lesions with bacilli and lesions due to bacilli are not of the same nature. This points a reason for caution in drawing too hasty pathological conclusions from the mere presence of tubercle bacilli, and shows that their active or passive rôle should be determined.

Studies of the possible avenues of bacillary elimination have shown that the bile may frequently carry bacilli from an undamaged liver; which shows that the bacilli found in the feces need not always come from swallowed sputum and that intestinal tuberculosis may have this manner of origin.

Heliotherapy has been greatly lauded and seemingly with some justice, but we must be content to await reports of a greater number of results.

It is interesting to note a growing appreciation of the fact that several forms of apical disease may be readily confounded with tuberculosis; one of these is attributed to obstruction of the upper (nasal) air-passages and is curable by removal of the obstruction. Doubtless some cures, thought to be of tuberculosis, have been of non-tuberculous nature.

Tuberculous meningitis remains much what it has been from the point of view of diagnosis and treatment; in life the laboratory test is the only certain one; very few cases recover. Therapy has been unsuccessfully directed to arachnoidal injections in the monkey. Cures due to repeated lumbar puncture were long ago re-

ported; this treatment has been supplemented by the use of Bier's method, but just how the meningeal circulation is thus influenced is not clear.

Artificial pneumothorax as a therapeutic measure has received much attention, and aroused much discussion, with no very definite results.

Surgical treatment of the tuberculous lung has been undertaken in larger measure and by special methods with some noteworthy though minimal results. Tuffier's conclusion is that in order to accomplish anything of great value in pulmonary tuberculosis, the surgeon must make early extirpation of the lesions, or induce very early immobilization of the affected region.

The subcutaneous use of emetin (alkaloid of ipecac) in hemophthisis is said to be of signal value, its favorable action to cause cessation of hemorrhage manifesting itself promptly with a favorable influence prolonged for several hours. The treatment is said to be devoid of danger.

A cursory survey of the lines of work now followed seem to reveal a lacuna in the study of tuberculosis. Since all are not tuberculous or some survive tuberculosis spontaneously, there must be something in most non-tuberculous organisms which protects them. Efforts in the direction of vaccination are being made with undetermined success. May not, some day, the natural elements of protection be known and become producible in those who have them not?

C. G. C.

LITERARY NOTES.

There are authors who can take an uninteresting subject and describe it in such a manner that the magic of their words does much to counteract its inherent stupidity, and there are other authors who are more fortunate in the selection of their subject, since it is one of interest, and who by the simplicity and directness of their diction achieve ends of much greater distinction. To the latter class belongs Dr. Richard C. Cabot, the author of "What Men Live By" (Houghton Mifflin Company, Boston), for his subject is fraught with so great a degree of interest that its appeal cannot be limited to one class, and his style of writing is of that exceptional sort that needs no array of qualifying adjectives to make it illuminating. The question that will occur to the reader before he opens this volume will be, What do men really live by? No doubt, if the reader depends on his prejudices and has not thought deeply on the subject, he will follow the bent of his limited purview and fall back on what has been to him the only thing to live by. This will be his first thought; but can it endure even after reading the opening chapters of Dr. Cabot's book? We think not; and we write thus because our own experience has taught us that, although we

approached this work with some well-armed preconceptions, it was not long before the author vanquished them by the sincerity of his own theories and the almost brusque manner in which sentence after sentence drove home truths that we had never thought of much weight in our summing up of what constituted the factors which kept men alive. And granting that the reader has divested himself of all obstacles to the full enjoyment of Dr. Cabot's plea for work, play, love, and worship, he, too, can enter the storehouse which the author so kindly turns over to him with no fear of disappointment and in no spirit that he will be taught a lesson that is not worth while.

What is the author's philosophy? What are his solutions of questions that have been uppermost in the minds of the thinking contingent for more years that one would like to admit? As to the first, it is based on the faculty of bringing an optimistic spirit to bear on the problems that have upset those serious students of sociology, who have been able to see only the annihilation of happiness in the welter of modern life; and, as regards the second, it is achieved by destroying the incrustations which have been getting thicker and thicker on certain questions, due beyond a doubt to the multifarious chapters which have been written in a spirit of pessimism that saw only the straining of muscles, of mind, of nerves in work; a deprecatory childishness in play; one phase in love—the physical, and that not with its pristine purity but blemished with the nastiness that was considered the modern note in literary work; a worship that was stripped of reverence and of symbolism. In fact, Dr. Cabot brings all these problems back to where they were before they were rushed in no gentle manner to the literary slaughter-house presided over by the modern essayists and pummeled and maimed until they fitted in nicely with the Procrustean bed which these destroyers of faith thought the only resting place for the world's problems. To effect this, he shows in a most convincing way that work, if it is the sort for which the individual has an aptitude, has compensations besides the monetary returns, that play is absolutely necessary if we would live as we should, that love and worship may have their sincere notes. By writing as he does, by riddling the stupidities of the day with barbed criticisms which are ever at his call, by showing us what really constitutes the natural mode of living,—doing what is elemental limited though it be by the conventions,—Dr. Cabot has evolved a book that should prove the right counterblast to all those asinine outpourings, not only in general literature but also in medical, which have held our attention altogether too long. And since it can be stated with considerable certainty that to-day most educators believe in the natural education of the child according to Dr. Montessori's teachings, why should it not be just as right to take the adult in hand and show him the error of his ways? Surely his points of view have been

wrong, for directly he feels 'out of sorts' he seeks advice with his doctor, and the doctor, imagining his pills and powders the panacea, gives small thought to other things. Of a decidedly different opinion is Dr. Cabot.

Dr. Woods Hutchinson's "The Conquest of Consumption" (Houghton Mifflin Company, Boston) while not a new book, is of such great value along certain lines that to omit a review of it in the Tuberculosis Number of the JOURNAL would be an injustice both to the author and publisher. Dr. Hutchinson is the free-lance in American medical criticism; and though the conservatives may scoff at his writings because he does not wallow in technicalities which in some quarters are considered the high water-mark of scientific education, it cannot be gainsaid that what he writes so brightly is without value. Now, though it must be admitted that as a rule when a medical man writes for the 'common people' he does so at the sacrifice of his scientific training, the rule like all good rules has exceptions, and the outstanding exception to-day in America is Dr. Hutchinson. It is easy to arrive at the reasons why, in deserting the medical journals for the larger field of lay journals, this author did not give up the best asset he possessed—his early medical training; for in taking the step there were no promptings, we take it, from a disgust for medicine, but rather a desire on his part to teach both doctor and public the value of writings that are not in the least invalidated by a sense of humor or by trenchancy of criticism. This has been done by Dr. Hutchinson in a way that reflects great credit on his honesty and judgment and his attitude of respect for his own profession and his desire to disseminate medical thought among the people. And in no book that he has written is this fortunate combination better illustrated than in the one under consideration.

What has not been written on the subject of consumption by the lesser men in medicine and the many lay workers who have taken it upon themselves to write reams of paper for the enlightenment of mankind! Who has had the temerity to read, let us say, one-tenth of the printed matter, or rather who in his right senses would wish to be that sort of hero? But perhaps this deluge of pamphlets, of articles, of books, though each one is short-lived, may have been productive of good; for to our way of thinking it must have occurred, not only to one medical man but to many after witnessing this uninterrupted flow of great mediocrity, that the times were ripe for an antidote in the shape of a clear exposition of a subject that concerns the welfare of the laity to a decided degree. Perhaps Dr. Hutchinson wrote his book inspired by the thought which we have just expressed; but whether this was the force which impelled him to write on tuberculosis or whether there was some

other prompting is of small moment, for the book is here so that he who runs may read. In a manner that is peculiar to the author—a manner that is half-humorous, half-cynical, but withal most engaging—he seizes the subject greedily and attacks it with the enthusiasm that cannot act in any other way than as an uplift on the reader. Of course, we do not mean the sensitive reader who is always on the alert to feel hurt when an author denounces what has been blindly and stupidly encouraged without any regard to reason, or the reader so deeply immersed in his own theories that those of another are necessarily an affront; but we do mean the reader who is a student in the widest sense of this term, and who knows that new points of view, if put forth after some experience and some thinking, should not be decried before an intelligent examination is given them.

Nothing speaks more forcibly or more favorably for the *Monographies Cliniques* than the timeliness of the brochure on heliotherapy, "*La Cure Solaire des Tuberculoses Chirurgicales*" by Drs. P. Vignard and P. Jouffray (Masson et Cie, Paris). To most of us in America the whole terrain of the solar cure for surgical tuberculosis is an untrodden field; what we know, we have learned, and learned very recently at that, from the publications in foreign journals, detailing the methods of various sanatoria in the Swiss Alps. The various publications of Rollier and his pupils, particularly those articles which have been freely illustrated with photographs, make the impression of fairy land tales. This little pamphlet by Vignard and Jouffray is particularly satisfying in so far as it sums up for us in judicial tone, the whole subject of solar therapy for surgical tuberculosis, not only in concise fashion, but with a literary flavor that lends both attraction and interest.

Under the head of "General Considerations" we are furnished with a historical résumé of the whole subject of heliotherapy. Following this is a chapter on the physical and physiological basis of heliotherapy, which goes rather extensively into the biologic properties of the ordinary spectral colors and of the ultra-violet rays which lie beyond the visible spectrum. The authors specifically emphasize that we must not fail to consider that the visible and the invisible rays both perform definite therapeutic functions, the visible rays furnishing the factor of warmth, and the invisible ones furnishing a subtle chemical element.

Part III of the monograph deals with the therapeutic action of sunlight, but unfortunately does not furnish much information. The authors frankly admit that "it is impossible, in the present state of our knowledge, to explain the exact nature of the mechanism of the reaction of the tissues to light." Part IV deals with the technique of the application of heliotherapy; and in this part the

authors are to be especially commended for laying great stress on the fact that in joint and bone tuberculosis light alone will not accomplish the desired ends. All the precepts of orthopedic surgery must be put into execution, just as they are in cases where heliotherapy is not used. Finally, Part V furnishes an interesting discussion of the comparative advantages of seashore and mountain as places where heliotherapy may be practised. We are told that the regimen of treatment in the high altitudes is apt to be variable and intermittent, owing to weather conditions, and that this is a decided disadvantage, owing to the fact that continuity of treatment is a highly important factor in bringing about a cure. It is on this basis that the authors recommend so highly the resorts on the Mediterranean coast. They draw an excellent word-picture of sea and mountain, and finally close with the advice that "patients suffering with pulmonary tuberculosis, with fever and cough, those who are obese, should most often be recommended to the mountains. The scrofulous, those suffering with lymph-node tuberculosis, anemic patients, those who are convalescent, and those who are rachitic should go to the seashore."

All in all, the authors conclude that heliotherapy seems undoubtedly to offer a favorable outlook for surgical tuberculosis, but they guard their statement by emphasizing the fact that the field of heliotherapy has not been thoroughly explored yet, and that the final chapter still remains to be written.

NOTE.—On account of the number of articles which were contributed to the SPECIAL TUBERCULOSIS NUMBER it was deemed advisable to divide it into two parts, the first constituting the regular March issue of the JOURNAL, the second the April issue. The latter will appear shortly so that all subscribers whether old or new will receive both parts within a period of ten days, thus making both parts almost one issue, and at the same time giving the reader an issue that is not too cumbersome. The entire number will contain all the articles promised in the Prospectus—thirty-six original papers, three Collective Abstracts, two Foreign Letters, Practical Memoranda, Therapeutic Notes, and Book Reviews.

ORIGINAL ARTICLES.

THE CHEMOTHERAPY OF TUBERCULOSIS.*

By H. GIDEON WELLS, M. D., of Chicago.

So far the history of the attempts to develop specific chemical therapeutic agents by means of experimental methods and chemical manipulations has, in a certain measure, repeated the history of the primitive attempts by empiricism, in that a number of usable specific drugs destroying protozoan parasites have been discovered, but as yet no specific bactericidal substance, suitable for administration either to man or animals, has been discovered by either method. Empiricism stumbled on quinine and mercury; scientific chemotherapy, under the inspiration and guidance of Ehrlich, has devised a number of compounds which will destroy in the living animal body several varieties of trypanosomes and spirochaetes, but we have yet to hear of a compound of equal potency in a bacterial infection. Why this should be we cannot say, but we are at least encouraged by the fact that there has not yet been found any reason of principle for considering that bacterial parasites are for any cause inaccessible to specific chemotherapy. As the infectious diseases of the temperate climates are predominatingly bacterial rather than protozoal, the incentive to apply to the bacterial infections the principles of chemotherapy, as formulated and developed by Ehrlich, is certainly great enough, but up to the present time this field remains untouched, while the chemotherapy of the protozoan diseases has a large literature. From Ehrlich's laboratory itself there has issued practically nothing as yet, but there are indications that before long we shall hear something on this subject from the headquarters of chemotherapeutic investigation.

Up to the present time the most active work on bacterial infections has concerned the pneumococcus, the leader in this work being one of Ehrlich's assistants, Morgenroth and his associates, who, having worked with chemotherapeutic quinine compounds, had noted resemblances between pneumococci and trypanosomes in regard to their behavior with bile salts, and collated these facts and the clinical repute of quinine in pneumonia. With this background,

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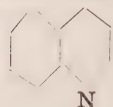
they took up an investigation to determine whether or not the derivatives of quinine which had been found effective in trypanosome infections might be effective against pneumococci, or at least might serve as a starting point for work on pneumococcus chemotherapy. They had learned that against trypanosomes quinine itself was less effective than certain derivatives, hydroquinine and hydrochlorisoquinine, whose relation to quinine is shown by the following graphic formulæ of the side-chains of the quinine molecule, in which the sole differences exist:—

CH. CH: CH₂ quinine.

CH. CHCL: CH₃ hydrochlorisoquinine.

CH. CH₂: CH₃ hydroquinine.

These compounds were found entirely ineffective against pneumococci, but more favorable results were obtained by modifying the



or quinolin group of the quinine molecule. To this group

in quinine is attached a CH₃O group, which was replaced in hydroquinine by a C₂H₅O group, forming 'ethylhydrocuprein,' a compound which was found to be very active in pneumococcus infections in mice. By injecting an oil solution of the free base subcutaneously, which permits of a suitable rate of absorption to secure the maximum effects from the drug, it was found possible to save from 80 to 100 per cent. of mice given subsequently a lethal dose of pneumococci; favorable but less strikingly curative effects were also obtained with infected mice. Quinine itself is quite ineffective under these conditions, as is the hydroquinine; but a propyl derivative was of a considerable activity, although somewhat less than the ethylhydrocuprein. It is interesting that, just as trypanosomes tend to become resistant to chemicals used unsuccessfully to destroy them ('drug-fast' is the term used to describe this condition), so, too, the pneumococci surviving treatment with ethylhydrocuprein produce strains resistant to this drug.

In addition, Boehncke¹ has shown that the combination of serum-therapy and chemotherapy is especially efficient, for of mice given multiple lethal doses of pneumococci, 20 per cent. were cured by chemotherapy alone, 33 per cent. by serum alone, and 90 per cent. by combined treatment, a result which has much significance.

As yet little has been done in human pneumonia with this drug, which produces such striking results in experimental animals, and the results so far obtained are not all that could be desired. Fränkel thought that an undoubted effect was produced in many cases, but Wright could see no favorable influence. A serious complication was a severe but transient amblyopia, observed in three of twenty-one patients treated with ethylhydrocuprein, an occurrence which again emphasizes the necessity for extreme care in the use of new compounds on human subjects. From these results it is evident

that the experimental work so far conducted on a specific chemotherapy for pneumonia has not advanced beyond the earliest stages, and that it is still far from practical therapeutics. But it is important that a definite advance has been made in the application of chemotherapeutic principles to bacterial infections, and we have every reason to hope that eventually the goal will be reached. The results obtained in so brief a time are decidedly encouraging.

Other sorts of bacterial infections have as yet received little consideration on the basis of Ehrlich's principles, but there is here and there a ruffling of the waters which indicates that forces are at work which will eventually appear above the surface. In this country we have particularly noticed the studies of Churchman,² who has found a remarkable selective influence of gentian-violet and dyes of related chemical structure upon bacteria, in that some bacteria are rapidly destroyed by the dyes, while others are entirely unaffected. It is the strange selectivity of this phenomenon that makes it of particular significance for chemotherapy; and the fact, that destruction of bacteria by gentian-violet in general occurs only in those organisms which retain this dye when stained by Gram's method, indicates the chemical nature of this reaction which determines the bactericidal effect. There are other more or less isolated studies and observations bearing on the problem of bacterial chemotherapy, but these will not be considered here, except as they relate to the topic of tuberculosis and chemotherapy.

The principles of chemotherapy, as laid down by Ehrlich, are of so fundamental a character that there is no limit to their application in infectious diseases, and possibly in other conditions, notably cancer. With the spirilloses and trypanosome infections, in which most of the work has so far been done, the conditions are favorable for the meeting of the drug and the germ, since with most forms of these diseases the germ lives chiefly or entirely in the circulating fluid. It is noteworthy that the only disease in which *therapia magna sterilisans* has been practised successfully on an empirical basis is also a blood infection, malaria. The consideration of tuberculosis from the standpoint of chemotherapy brings in distinctly new problems, owing to the fact that the bacteria are, in large part, located in points specifically removed from the circulation by proliferating tissues. The avascularity of the tubercle must of necessity have a large influence on the meeting of the drug and the germ; and this condition has perhaps been responsible for the lack of success of the innumerable empirical attempts at chemotherapy which have been made with the disease in the past. Avascularity of an infected tissue may, perhaps, make for either assistance or hindrance in chemotherapy, for we can imagine that the drug might accumulate in the avascular area, just as, for instance, calcium salts do, or, entering avascular and vascular tissue alike, it might remain longer where there is no circulation. Absence of

living cells may also make a difference in that certain drugs may be either destroyed or activated by living cells, and hence have either a greater or less effect in the necrotic portions of the tubercle than elsewhere in the body. These and other points present themselves, and to attack the problem of tuberculosis chemotherapy it would seem to be necessary to learn first just to what extent different classes of chemical substances enter tubercles, both early and advanced, how much they tend to accumulate specifically in the tissues, and how long they remain there. For a chemical which is to destroy the tubercle bacillus, it would seem, should be one that will enter readily into the avascular tuberculous lesions, and, if possible, enter or accumulate in such tissues more than in normal tissues.

The problem is further complicated by the chemical composition of the tubercle bacillus itself, with its large proportion of resistant fatty and waxy material, which must, it would seem, make its permeation and destruction a very different matter from the attack upon the naked and delicate trypanosomes, spirillæ and spirochaetes. Hence the permeability of the tubercle bacillus for chemicals of different classes becomes a fundamental question in connection with the main problem. In the investigation of the subject, the fatty matter of the tubercle bacillus, while perhaps an obstacle to chemotherapy, makes attacks of the problem appear somewhat easier, since the permeability of the bacteria would seem to be largely determined by this substance, which can be extracted from them in large amounts and rendered available for experimental work *in vitro*, without, at the beginning, calling for the extensive animal experimentation which is essential in the study of the chemotherapy of protozoan infections. The influence of the fatty constituents of the cells upon the permeability of tissue cells to drugs and dyes has already been extensively investigated, and we have, therefore, many clues for investigation of the permeability of *B. tuberculosis*.

In planning a systematic investigation on the chemotherapy of tuberculosis, therefore, it would seem desirable first to determine the entrance of various classes of substances into the tubercle and into the bacteria, since the effective tuberculocide must be, theoretically, one which enters freely and, if possible, selectively into the avascular tubercle, and with like facility passes through the fatty sheath of the bacillus. We have found it possible to attack directly some of the problems involved, while others have called for the preliminary studies of certain fundamental questions.

A study of the permeability of tuberculous lesions demonstrated that they behave like any simple colloid in this respect, permitting crystalloids to diffuse readily through them, but being little, if at all, permeable to colloidal molecules.³ These facts were determined in the following way: Guinea-pigs and rabbits with tuberculous lesions were injected with various iodine compounds (chiefly KI,

but also iodoform, iodipin, and ethyl iodide), and after varying periods of time the animals were bled to death, and the blood and tissues analyzed for iodine. The main results obtained were as follow: The blood practically always contains more iodine, no matter in what compound it is given, than any tissues or organ, whether normal or tuberculous. For example, the liver usually contains about one-third as much iodine per gram as the blood of the same animal, the spleen about the same as the liver, the lungs a little less, while the muscle contains but about one-eighth to one-tenth as much as the blood. The kidney, however, as a rule, has as large a proportion as the blood, and sometimes considerably more during active secretion.

The effects of pathological changes upon the tissues were very definite. Tuberculous lymph-glands do, as Loeb first showed, take up in general relatively more iodine from the blood than do the liver, spleen, and lungs of the same animal. Thus, in 9 of 11 experiments the tuberculous lymph-glands contained more iodine than the liver, and in the best experiments with KI the amount approaches that in the blood. It is especially noticeable that, when the caseous material was abundant enough to permit of separation from the rest of the gland substance, it contained much more iodine than did the non-caseous portion of the glands, as seen in experiments Nos. 4, 5 and 14, where the figures are:—

	No. 4	No. 5	No. 14
Gland substance.....	0.295	0.285	0.007
Caseous contents.....	0.481	0.790	0.013

Tuberculous lesions in the eye, show, as was also found by Loeb and Michaud in four experiments, an increased capacity for taking up iodine, as shown in Table I.

TABLE I.
IODINE IN TUBERCULOUS AND NORMAL EYES.

	Weight of Eye		Total Iodine		Mgram. iod. per gram.		Form of Iodine Injected
	Normal	Tuberculous	Normal	Tuberculous	Normal	Tuberculous	
1.	2.2	4.5	0.48	1.7	0.220	0.381	KI, 4 hrs.
2.	2.7	3.6	0.49	0.54	0.182	0.150	KI, 6 hrs.
3.	3.2	4.0	0.25	0.76	0.078	0.166	KI, 8 hrs.
4.	2.8	4.8	0.0	0.0	0.0	0.0	KI, 12 hrs.
5.	4.0	4.8	0.15	1.38	0.038	0.267	Iodoform
6.	3.0	4.8	0.28	0.58	0.093	0.117	Iodoform
7.	2.0	5.2	0.015	0.033	0.0075	0.006	Iodipin
8.	2.2	5.8	0.062	0.86	0.028	0.148	Ethyl iodide
Average	2.76	4.7	0.216	0.720	0.081	0.154	

Of these eight experiments, without exception, the amount of iodine is greater in the tuberculous eye than in the normal eye, although in two (2 and 7) the proportion of iodine is slightly greater in the normal eye. Taken altogether, there is over three times as much iodine in the tuberculous eyes, and nearly twice as

large a proportion. The low figure for iodine (7) corresponds entirely with the proportion of iodipin in the liver of the same animal (0.008), and it is evident that after injections of iodoform and ethyl iodide the iodine readily enters the eyes, especially the tuberculous eyes, although whether as organic or inorganic compounds we have not ascertained.

That the entrance of iodine into tuberculous tissue is not characteristic of tuberculosis is established by the analyses of the tissues of animals in which necrosis and exudates were produced experimentally. In 10 rabbits which had the left kidney rendered totally necrotic by ligation of all the blood-vessels, there is found to result a great increase in the size of the organ, from an average of 7.2 gm. to 15.3 gm., because of hemorrhage and edema. In spite of the avascularity of these kidneys, iodine permeates them rapidly, so that six hours after injection there is found to be, on the average, almost identically the same proportion of iodine in the avascular necrotic kidney and in the normal kidney, a proportion which, as pointed out previously, approximates that of the iodine content of the blood more closely than in any other organ. Therefore, it seems evident that in a short time the iodine in the blood will penetrate even so large an avascular area as an entire kidney, and reach practically the same concentration as in the blood itself.

Of all the tissues, however, the normal kidney alone seems to be so permeable for iodine that it comes to contain the same proportion as the blood, a fact which is presumably related to the functional activity of the organ. If we take another tissue which is not normally so permeable for iodine, such as the muscle, we find the interesting fact that necrotic areas in this tissue also tend to contain approximately, as much iodine as the blood of the same animal, while the normal muscle tissue, in spite of its much greater blood-supply, contains much less iodine.

The explanation of these results, it seems to us, must be as follows: The partial impermeability of living cells, which presumably differs in all organs and cells, is destroyed when the cell is killed. Therefore, the readily diffusible iodine compounds present in the blood and tissue fluids will diffuse into the necrosed tissue elements just as they would into any inert water-filled colloidal mass, with the resulting tendency, as shown by our figures, to approach osmotic equilibrium of iodine in blood and necrotic tissue. The large amount of iodine present in necrotic tissues, whether tuberculous or otherwise, is, therefore, dependent on purely physical conditions, *i. e., the destruction of the semi-permeability of the cells.* That it does not depend upon any chemical attraction, or even a specific physical 'absorption,' is shown by the fact that if some time is allowed for the iodine to be excreted in part from the body after injection, it leaves the necrotic tissues, the blood and the normal tis-

sues *pari passu*. Support is given to this interpretation by the results of implantation of iodine compounds at various intervals. The agar was introduced at a temperature of about 50° C., and solidified in a lump which soon became encapsulated, and after a time permeated by invading strands of granular tissue. The results of analyses from these experiments seem to show a marked permeability of agar for iodine. In one experiment, for example, in which the tissues were examined only one hour after injection of the iodide, even this quickly, the avascular agar contained as much iodine as the liver. In eight of twelve experiments, the agar contained a larger proportion of iodine than the liver, in only one was it considerably less.

As is to be expected, inflammatory exudates are prone to approach the blood in iodine content, but we found no evidence of any selective tendency of iodine to enter the inflammatory exudate, there nearly always being somewhat less iodine in the exudate than in the blood. The presence of iodine in the exudate would seem in all cases to be dependent entirely on simple diffusion, as in the case of necrotic tissues and implanted agar.

The high iodine content of the tuberculous eyes is presumably to be explained, therefore, as due in part to the inflammatory exudate present in those eyes, and probably in less degree to the necrosis of the tuberculous tissues.

Similarly, compression atelectasis of the lung, produced by pleural exudates, with the resulting greater or less edema and inflammatory exudate in the alveoli, is associated with a corresponding slight increase of iodine in the injured lung. These observations would seem to explain entirely, and on a simple physical basis, the observations of Bondi and Jacoby, Fillipi and Nesti, and Loeb, that drugs tend to enter inflammatory exudates. They enter simply because there is present an exudate which offers no resistance to their permeation in the effort to establish an osmotic equilibrium with the blood, and not because there is a specific affinity between pathological tissues and blood. Therefore, we are led to the conclusion that the supposed affinity of certain drugs for certain pathological tissues merely depends on a decrease in the normal impermeability of the diseased cells, or diffusion into inflammatory exudates present in the diseased area, or both. If this is the case, we might expect a non-diffusible colloidal substance to be unable to penetrate avascular diseased areas which are highly permeable for crystalloids, and this was found to be true. Tubercles, where there is no blood-supply, are relatively or absolutely impermeable to foreign proteins present in the blood.

This was shown by injecting egg white intravenously into guinea-pigs with well-defined tuberculous lesions, and bleeding the animals to death three hours later. Carefully prepared extracts of the different tissues were injected in varying-sized doses into normal

guinea-pigs, and three weeks later these animals received intraperitoneal injections of egg albumin. All the animals gave severe anaphylaxis reactions, except those which had received the caseous material removed from the centres of tuberculous areas. As the sensitizing dose of egg albumin is less than one-millionth of a gram, it is evident that during three hours no appreciable quantity of this foreign colloid had diffused into the centre of the tubercle, whereas in the same period of time crystalloid KI penetrates such areas thoroughly. Hence, we conclude that necrotic tissues, whether tubercles or other lesions, behave like any non-living colloidal mass, into and from which crystalloids diffuse readily and rapidly, while colloids enter very slowly or not at all. The bearing of this fact upon the chemotherapy of tuberculosis is obvious, for it indicates that the avascularity of the tubercle is no barrier to the entrance of chemical agents, provided these be crystalloids, but that in all probability all colloidal agents will have difficulty in coming in contact with the bacilli. Whether a crystalloid coming from the blood will tend to accumulate in the tubercle apparently depends upon whether it is made insoluble in the tubercle, as is the case with calcium entering from the blood. Such is not the case with iodine compounds, nor, according to experiments to be mentioned later, with copper compounds. Possibly bactericidal substances may be found, which, like calcium, will tend to accumulate in tuberculous areas and keep the fluids of the tubercle saturated with their soluble derivatives.

In view of the abundance of fatty granules present in tubercles and the fatty character of the tubercle bacillus itself, the entrance of fat soluble substances into tubercles was also investigated by Corper, the fat-soluble dyes being used for reasons of convenience.⁴ Corper's experiments showed that, no matter how completely the fat of an animal might be saturated with fat stains, such as Sudan III, Scarlet R, and many others, no trace of the dye ever appeared in the tubercle, either in the fat droplets of the tubercle or in the tubercle bacilli themselves. From this it would appear that the fats microscopically visible or chemically demonstrable in tubercles are derived chiefly or solely from the pre-existing fats and lipoids of the disintegrating cells, and not by deposition from the fats in the blood. Fat dyes fed to animals are absorbed with the fats, circulate and are deposited with them, and seem never to leave these fats to enter the intracellular fats or lipoids of the brain, etc. These observations, therefore, indicate that fat solubility is scarcely a property which can be used to cause the entrance of a chemotherapeutic agent into tubercles, although, *a priori*, fat substances might be expected to have this property.

The behavior of the tubercle bacilli themselves to fat soluble dyes has been studied by Sherman,⁵ for, in view of the fatty or waxy content of tubercle bacilli, it might be expected that the fat-solubil-

ity of a chemical would be an important factor in determining its bactericidal action, especially for this organism. There is, indeed, a little literature on the staining of bacteria by fat dyes, and a prevalent belief that acid-fastness depends largely or solely on the 'wax' of the bacteria of the acid-fast group. Tubercle bacilli are known to stain with osmic acid (Unna) and, according to most, but not all, observers, they do not stain with Sudan III or Scarlet R. Miss Sherman investigated the behavior of many sorts of fat-soluble and fat-insoluble dyes, and found that in cultures of tubercle bacilli there is a considerable amount of fatty material free between the bacteria which is readily stained by almost any fat-soluble dye, but these dyes do not stain the bacilli themselves readily, if at all. Such potent fat stains as Sudan III and Scarlet R, for example, do not stain tubercle bacilli distinctly, even after soaking in the dye solution twenty-four hours in the incubator. On the other hand, many dyes which are insoluble in fats, such as fuchsin, methylene-blue, and eosin, stain tubercle bacilli rapidly and intensely. These observations evidently determine that the chief factor in the staining of tubercle bacilli is not the fatty content, as commonly believed. On the other hand, the characteristic acid-fastness, and perhaps the Gram-staining, is a function of the sheath or capsule of the bacilli, for Miss Sherman has confirmed the observations of Benians⁶ that when tubercle bacilli are crushed they lose their acid-fastness and become Gram-negative. She found that simply crushing tubercle bacilli by rubbing them between cover-slip and slide, not only deprives the bacilli of their acid-fastness, but also makes them permeable to the fat-soluble dyes, to which intact bacilli are impermeable. Hence the influence of the fatty content of tubercle bacilli seems to be definitely excluded as the determining factor in the permeability of the bacilli by dissolved substances. (This is dependent upon a sheath or capsule of some sort, possibly chitinous, and the waxy material plays at most a secondary rôle in the staining and general permeability.) The bearing and importance of these facts in the study of a rational chemotherapy of tuberculosis is apparent.* Evidently fat-solubility is not a necessary quality in a substance which is to penetrate the tubercle or the tubercle bacillus, but, apparently, quite the opposite.

The fact that water-soluble dyes can penetrate tubercle bacilli adds much interest to the investigation of the behavior of tuberculous lesions, as well as the bacteria, when the injected animals are subjected to the vital stains, which have been so actively developed and studied in recent years in connection both with cytology and chemotherapy, largely through the influence of Ehrlich and Goldmann.

*It may be mentioned that Corper observed no evident therapeutic effect from fat dyes given to tuberculous guinea-pigs, and also that they have no considerable bactericidal effects, for tubercle bacilli grow well in culture media in the presence of many of these dyes.

Goldmann⁷ reported in 1909 an exhaustive investigation of the effect on the tissues of the normal body of a group of dyes, including the trypan-red and the trypan-blue already mentioned by Ehrlich and his workers, comparing with them two other dyes which act in a similar way—isamine-blue and pyrrhol-blue. All these dyes have the common property of vitally staining granules in certain interstitial cells very deeply and permanently, and thus giving a general and lasting stain to the body. After Goldmann's introduction of these dyes, a considerable number of workers investigated by means of these stains various physiological and pathological processes in the animal body, and during 1912 several communications from Goldmann appeared, as well as two from Schulemann,⁸ one from Lewis,⁹ one from Bowman, Winternitz and Evans,¹⁰ and one from MacCurdy and Evans, as well as several others which do not so especially have to do with tuberculosis work and which may, therefore, remain unmentioned.

Among all these workers, it is natural that some should be interested in the relation of these dyes to tuberculosis. Goldmann¹¹ himself, in several of his later papers, reports the results of his investigations on tuberculosis in mice, especially in regard to the origin and histogenesis of the tubercle. Bowman, Winternitz and Evans, using rabbits, endeavored by means of the trypan-blue dye to ascertain the histogenesis of the liver tubercle. Lewis showed that trypan-red and isamine-blue injected, intravenously or intraperitoneally, into tuberculous rabbits penetrated the pulmonary tubercles in the few cases which he reports.

Beyond suggesting the possibility that these results may sometimes be of use in the treatment of tuberculosis, none of these workers has taken up the chemotherapeutic value of vital stains in tuberculosis. Very recently, however, a series of papers has appeared dealing with the so-called Finkler's *Heilverfahren*, the several papers being by von Linden,¹² Meissen,¹³ Strauss,¹⁴ and Selter.¹⁵ The method uses either methylene-blue (chloride or iodide), or copper compounds, or both together. More or less favorable results were reported in the few experimental animals tested with the methylene-blue treatment, and also in a number of human tuberculous patients.

DeWitt¹⁶ has been engaged in an investigation of these dyes in this laboratory, and has published certain preliminary observations. She has found a considerable number of dyes which penetrate tubercles with greater or less readiness, and are well borne by the animal; some of these dyes also penetrate the tubercle bacilli themselves, and some have a bactericidal power on tubercle bacilli *in vitro*. Not to consider at length all the numerous dyes investigated by DeWitt, it may be said that trypan-blue was found of special interest, because it penetrates the tubercle easily, and remains in it for a long time, although it does not enter the bacilli

so well as some other dyes, and is not of itself bactericidal. The same is true of trypan-red, which was first described in this connection by Lewis. Some of the methylene-blues, however, penetrate both tubercles and tubercle bacilli well, and are strongly bactericidal for tubercle bacilli. This work has brought out many important factors in addition to the above, and has suggested the route to take in developing compounds which might be capable of entering the tubercle and the bacilli, and which might have the desired degree of bactericidal action without being too toxic to the animal. It may be added that, in spite of the statements of von Linden and her associates, DeWitt did not find any definite curative effects from methylene-blue or from any of the other dyes in infected tuberculosis guinea-pigs.* Even when the methylene-blue molecule was altered by replacing its sulphur atom by selenium or tellurium, no therapeutic effects could be obtained in tuberculous guinea-pigs; the iodide of methylene-blue was also ineffective, and no results were obtained by other dyes related to methylene-blue.

COPPER IN THE CHEMOTHERAPY OF TUBERCULOSIS.

Copper, in view of its reputed germicidal action and its relatively low degree of toxicity for higher mammals, would seem to have possibilities as yet unrealized in the therapeutics of infectious diseases. There is considerable literature of one sort and another on the use of copper salts for the treatment of infectious diseases, but most of it is sporadic in character, and apparently the results described have not been such as to lead to any very general adoption of copper in chemical therapeutics. In recent years, perhaps the most satisfactory results have been obtained with copper in the treatment of diseases due to higher fungi, such as *oidiomycosis*, *actinomycosis* and *sporotrichosis*, as recommended especially by Bevan. With the introduction of the principles of chemotherapy by Ehrlich, it seemed possible to us that organic compounds of copper might be successfully developed, which would have distinct advantages, in the treatment of bacterial and fungous infections, over the arsenic compounds which have been so successful in protozoan infections, in view of the supposed high bacterial and low toxic properties of copper in comparison with arsenic. For some time experiments have been conducted in this laboratory with the object of testing thoroughly and, if possible, developing this hypothesis with particular reference to the treatment of tuberculosis.

While we were engaged in this work there appeared the rather spectacular series of papers of von Linden, Meissen and Strauss, already quoted, in which it was stated that copper salts of various

*Lewaschew (*Muench. Med. Wochenschr.*, Vol. LIX, p. 1372, 1912) has reported favorable effects on advanced cases of pulmonary tuberculosis with a chloride of parafuchsin (*tryparosan*), but no animal experiments are described and the data offered are too meagre to permit of critical consideration.

sorts have a striking therapeutic effect on tuberculosis, both of man and experimental animals. Copper chloride, copper potassium tartrate, and especially a 'copper-lecithin' compound, were chiefly used, and the best results are attributed to the last named, although the nature and method of preparation of these potent agents are nowhere described. We have reviewed this work critically elsewhere¹⁷ and found many unsatisfactory features, at least in its presentation, which compel a feeling of scepticism concerning the true merits, despite the later enthusiastic reports of Strauss concerning the clinical achievements in lupus. In any event, the results of the animal experimentation are totally in disagreement with our own experimental results with copper compounds of varying sorts, including particularly copper salts of the amino-acids, copper acetate, copper sulphate and copper oleate. In large numbers of experiments on both rabbits and guinea-pigs, using various compounds and dosages of copper at various stages of the infection, we have never observed the slightest beneficial effects. Since publishing the aforementioned paper we have completed many more experiments with copper, but all, unfortunately, with the same negative results. Furthermore, direct experiments, which will be reported more fully elsewhere, have indicated that the bactericidal power of copper salts is much lower than is commonly believed. For example, DeWitt has found that tubercle bacilli can be suspended for days in a 1 per cent. solution of copper sulphate without evident decrease in their virulence for guinea-pigs, and staphylococci can be exposed for fifteen minutes to a 10 per cent. solution of copper sulphate without being killed. Nor have we found that other copper compounds have any greater bactericidal effects. It does not seem probable that so inert an element will give striking therapeutic results—certainly we have been able to obtain no encouragement from our own experiments. To be sure, there are also favorable clinical reports on the treatment of actinomycosis and blastomycosis with copper compounds, but there are clinicians who state that they have had equally good results with other methods, and the only known recovery from systemic blastomycosis occurred under the ministrations of Christian Scientists! Pekanovich,¹⁸ who attempted to utilize the von Linden methods on a series of patients with pulmonary tuberculosis, and his colleague Somagyi, who treated skin tuberculosis with copper compounds, observed no favorable effects.

GOLD IN THE CHEMOTHERAPY OF TUBERCULOSIS.

In closing, a review of recent studies described under the above title is warranted by their highly interesting character. These, as reported by Feldt,¹⁹ are based on two observations, one made years ago by Koch, that gold salts have a remarkably high bac-

tericidal effect on tubercle bacilli, as compared to other metals. This has been corroborated to some extent by Bruck and Glueck,²⁰ who obtained decided therapeutic effects by repeatedly injecting gold and potassium cyanide intravenously into patients with lupus, and also Feldt, who found gold salts effective in dilutions of 1:100,000 up to 1:2,000,000, as contrasted with copper salts, which Feldt found, as we have done, to be "on the border of total inactivity," inhibiting growth when in asparagin media only in concentrations of 1:5,000. The other basic observation is ascribed to Liebreich, and is the property of cantharidin to cause severe local reactions in any inflammatory focus, whether tuberculous or not. This suggested to Spiess that cantharidin might be used as a vehicle to carry gold into a tuberculous lesion, and experiments performed along this line have given encouraging results.

By introducing various organic radicals into the cantharidin molecule, its toxicity may be reduced without destroying its effect on tuberculous lesions. Most effective of the compounds tried was that with ethylene-diamine, which reduces the toxicity about 680 times, and this product was linked to gold cyanide or chloride to form the compound used in the tests. On account of the necessity of making injections into guinea-pigs by the subcutaneous route, where the gold compound undergoes reduction and largely fails to enter the blood, experiments with these animals were not satisfactory. With rabbits, in which repeated intravenous injections can be made, the results were much more striking. In either, animal injections are followed in twenty-four hours by a very severe local reaction around existing tuberculous reactions, which Feldt explains as a local tuberculous reaction caused by tuberculin set free from the bodies of the bacilli killed by the blood.* In rabbits there was observed a cessation in the spread of the disease, increase in weight and a prolongation of life for several months, associated with a fibrous transformation of the pulmonary lesions. With the guinea-pigs, in spite of the unfavorable conditions of administration, some effects were also observed. These observations as reported give a favorable impression, and further investigations with the gold-cantharidin preparations will be awaited with much interest.

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- ⁵ Sherman (*Journ. Infec. Dis.*, Vol. XII, p. 249, 1913).

*Heubner suggests that the local reaction, which is hemorrhagic, may be produced by the "exquisite vascular action of gold" (*Deutsch. med. Wochenschr.*, Vol. XXXIX, p. 690, 1913).

- ⁶ Benians (*Journ. Pathol. and Bacteriol.*, Vol. XVII, p. 199, 1912).
- ⁷ Goldmann (*Beitr. zur klin. Chir.*, Vol. 64, p. 192, 1909).
- ⁸ Schulemann (*Berl. klin. Wochenschr.*, Vol. 49, p. 497, 1912; *Beitr. zur Vital-färbung. Arch. fuer mik. Anat.*, Vol. 79, p. 233, 1912; *Zeitschr. fuer exper. Pathol.*, Vol. 11, p. 307, 1912).
- ⁹ Lewis (*Arch. Int. Med.*, Vol. 10, p. 68, 1912).
- ¹⁰ Bowman, Winternitz and Evans (*Zentralbl. fuer Bakt.*, Vol. 65, p. 403, 1912).
- ¹¹ Goldmann (*Verhandl. der path. Gesellsch.*, Vol. 14, p. 138, 1910; *Beitr. fuer klin. Chir.*, Vol. 78, p. 1, 1912; *Lancet*, p. 1183, 1912; *Berl. klin. Wochenschr.*, Vol. 49, p. 1689, 1912).
- ¹² Von Linden (*Beitr. zur klin. der Tuber.*, Vol. 23, p. 201, 1912; *Muench. med. Wochenschr.*, Vol. 59, p. 2560, 1912).
- ¹³ Meissen (*Beitr. zur klin. Tuber.*, Vol. 23, p. 215, 1912).
- ¹⁴ Strauss (*Beitr. zur klin. der Tuber.*, Vol. 23, p. 223, 1912).
- ¹⁵ Selter (*Beitr. zur klin. der Tuber.*, Vol. 23, p. 261, 1912).
- ¹⁶ Lydia M. DeWitt (*Journ. Infec. Dis.*, Vol. XII, p. 68, 1913; Vol. XIII, p. 378, 1913).
- ¹⁷ Corner, DeWitt and Wells (*Journ. Amer. Med. Assoc.*, Vol. LX, p. 887, 1913).
- ¹⁸ Pekanovich (*Deutsch. med. Wochenschr.*, Vol. XXXIX, p. 1352, 1913).
- ¹⁹ Feldt (*Deutsch. med. Wochenschr.*, Vol. XXXIX, p. 549, 1913).
- ²⁰ Bruck and Glueck (*Muench. med. Wochenschr.*, Vol. LX, p. 57, 1913).

THE DIFFERENTIAL DIAGNOSIS OF INCIPIENT PULMONARY TUBERCULOSIS.

By CHARLES M. MONTGOMERY, M. D., of Philadelphia.

Despite all our modern equipment for the diagnosis of tuberculosis, and notwithstanding all that has been said and written on the subject, we are constantly being confronted with cases that make us painfully realize our diagnostic limitations. To speak glibly or to write fluently on the differential points is simple and easy, but actually to make the diagnosis in some of these obscure cases, or to describe in any really helpful fashion how it is to be done, may be a very difficult or even impossible task. This large and important subject will be treated very briefly in the present paper, emphasis being laid on some of the features which have struck the writer in his own work as of special moment.

Inasmuch as the ability to diagnose incipient tuberculosis demands a broad knowledge of incipient disease in general, no one is properly equipped for the task who has not had thorough preparation both in general medical and special tuberculosis work. This remark perhaps applies with less force to physicians whose duties lie wholly within sanatoria, but it does apply specially to those on whom falls the responsibility for sifting out these cases and determining whether they have tuberculosis or not. Besides the value of directly studying cases where all sorts of medical diseases are handled, and also of observing patients in places devoted primarily to tuberculosis, one reaps the additional advantage of keeping in touch with physicians trained along different lines, each with his own special interest and bias, all of which broadens one's outlook and stimulates interest in a type of case resembling tuberculosis in many ways but not definitely attributable to it. By such a developing process one becomes more conservative in his opinions, and seeing his limitations more clearly is in a better position to make progress in a very difficult field of endeavor. The great value of special tuberculosis study to all physicians is asserted by undergraduate students, by resident physicians and by physicians doing general work; in fact, by all who have had the opportunity to pursue such special study. For the specialist in tuberculosis it is well to keep in touch with general medical work as far as this is possible. One of the most effective and impressive methods of studying early tuberculosis is to follow up the final outcome of all cases labeled non-tuberculous which originally exhibited any evidence of tuberculosis.*

*Cruice: The Importance of History in the Diagnosis of Incipient Tuberculosis. (*Med. Record*, August 24th, 1912.)

The earlier in the progress of incipient tuberculosis we try to make a diagnosis the more difficult will our task be and the longer the time required for studying the case, so that a single visit on the part of the patient may be entirely inadequate. The patient as well as the physician should realize that several visits or constant surveillance for a time may be essential to arriving at a satisfactory opinion.

To the physician trained in tuberculosis work success in diagnosis will depend first of all on the care and thoroughness with which he handles each individual case, for it is from painstaking work and not from diagnostic short-cuts that he will derive most assistance in many of the very difficult cases.

History and Symptoms.—In the diagnosis of incipient tuberculosis, as of incipient disease in general, the history and symptoms may be of paramount value, furnishing at times the only evidences of illness in the patient, so that they must be investigated to the fullest extent. We must not rest content with what the patient vouchsafes to mention or what may be learned from a routine perfunctory set of questions, but our investigation must be carried on in such a way and suggestive points followed up in such detail that all useful data may be elicited. Cases of tuberculosis in the family may be overlooked unless the various illnesses and deaths receive detailed and searching inquiry. But while a positive family history is often of value, a negative one is to be disregarded unless very complete and reliable. Previous maladies, especially if slight, are apt to be forgotten by the patient or considered as unimportant. In regard to some of these cases another member of the family may furnish additional useful information. Frequent colds, hemoptysis, no matter how slight or of how ancient date, a sense of fatigue in the morning or after exertion, pains of a general nature or limited to the chest, a history of malaria, of pleurisy or of fistula, these and many other pieces of information may serve as useful clues in the diagnosis. Any cause of ill health not definitely explained should arouse the suspicion of tuberculosis. On the other hand, if a patient's condition of poor health has long remained stationary, and if the pulmonary signs remain slight or absent, search should be renewed for some other etiological factor.

The Temperature.—Still in the forefront among the evidences giving valuable information regarding the diagnosis of tuberculosis stands the temperature record. Like other manifestations of the disease it must be carefully studied if we are to derive full benefit from it. Leaving the thermometer in the patient's mouth a sufficient period, five, ten or more minutes, taking the temperature at frequent intervals for one or more days, a study of its behavior at the menstrual epoch and after exercise—these and other details in the use of the thermometer may lead to valuable results. But at the same time other sources of slight rise in temperature must be

borne in mind, such as occur in other forms of slight toxemia, infected teeth and gums, diseased tonsils, slight latent infections in the genital tracts of both sexes, fever of nervous origin, and a tuberculous focus located in some portion of the body outside the lungs. The patient in many cases is not aware of fever, though associated symptoms may be present. On the other hand, it is well to recognize that distinctly active tuberculosis may occasionally be present in the total absence of fever.

The Weight.—The importance of the weight record in the diagnosis of tuberculosis is taken advantage of by everyone. It is well to know a patient's weight in relation to his height, his average weight, and the extremes before he became ill, and the extremes since his symptoms developed. A general state of subnormal weight is not as significant as an appreciable loss. A very decided gain under favorable conditions suggests tuberculosis; a failure to gain under proper treatment, the other evidences of toxemia and the physical signs becoming no worse, furnishes some evidence against the diagnosis of tuberculosis.

The Sputum.—It is a matter of regret that even in these enlightened days we have to reiterate that the absence of tubercle bacilli from the sputum does not indicate freedom from tuberculosis. It should be recognized that the least suspicious looking sputum may contain tubercle bacilli. In doubtful cases the sputum should be examined on a number of different occasions, and twenty-four hour specimens should be used. Methods of concentration and animal inoculation may be employed. This finding in the young and in the old and in those suffering from other ailments is particularly useful. The administration of potassium iodide to assist in the elimination of tubercle bacilli is to be condemned. The stools may yield positive findings when other methods fail. The presence of albumin and of microscopic blood in the sputum, and of various drugs after oral administration, is regarded by some as of great diagnostic value, but the reports on these subjects are not uniform. A record of hemoptysis, even if there has only been streaking of the sputum with blood, and even if the record dates back some time, should always make one try to establish a definite cause for its occurrence. In doubtful cases other sources of hemorrhage must be investigated, such as other pulmonary diseases, extra-pulmonary conditions causing congestion of the lungs, like heart disease, and sources in the upper respiratory tract, including the mouth, as well as certain systemic diseases.

The Blood.—While the blood in most cases of early tuberculosis does not give much assistance, it is well to remember that this disease is one of the commonest causes of a mild secondary anemia, and that in the average early chronic case we do not obtain either an absolutely normal reading, or a hemoglobin that has fallen much below 70 per cent.

The Tuberculin Test.—Tuberculin is regarded by most writers as of decided value in the diagnosis of tuberculosis, being lauded in the highest terms by some, and conservatively estimated by others as a link in the evidence pointing towards tuberculosis. Considerable work has been done to show its value as an indicator of the activity of the process. The reaction is most useful when it produces changes in the physical signs in the lungs. Reaction at the site of injection and rises in temperature and other systemic signs of toxemia do frequently occur, however, when clinical tuberculosis does not exist; and a positive cutaneous tuberculin reaction may be only temporarily present during the course of an infectious fever. The writer believes that a positive reaction does not often give much assistance in the diagnosis, and that a negative response is distinctly more useful though by no means absolutely reliable.

Abderhalden's Test.—Abderhalden's serum test has been reported by several writers to give unusually instructive information in regard to the diagnosis of tuberculosis. Further reports on this subject will be awaited with interest.

The Physical Examination of the Chest.—In eliciting physical signs, and also in interpreting them, long practice is a *sine qua non*, but even this does not replace a careful and time-consuming examination of difficult individual cases. Only a few features pertaining to the examination of the chest will be alluded to here. A point sometimes neglected is the need for careful examination of each side of the chest individually (being of course carried on in addition to and not in the place of symmetrical examinations) in order to avoid the mistake of overlooking slight symmetrical lesions. Knowledge that the tuberculous process usually commences near the apices may be of diagnostic assistance, but the first evidences may occur elsewhere, particularly at the root of the lungs. Moreover, lesions at the apex are not always, though usually, tuberculous in origin. Inspection is one of our most helpful allies in early diagnosis, often revealing local or general deficiencies in nutrition and expansion that may be of more significance than any of the other physical signs. Percussion may show slight changes in resonance, even a hyperresonance, or a narrowing of the normal apical note, or some limitation of motion of the lungs along the pulmonary borders in different parts of the chest. Auscultatory signs are commonly considered to reveal the earliest abnormalities in physical signs, though we find many cases in which this does not hold true, because the cases are really old ones that have only recently taken on renewed activity, the main signs being those of a healed lesion, in which the auscultatory signs are not necessarily the most distinct. Any abnormality in the breath sounds is to be looked for,—diminished breathing, roughened breathing, 'granular breathing,' prolonged expiration, and breath sounds with more or less of a bronchial or even cavernous character. Râles may be found at the apices

or other parts of the chest, usually, though not always, localized, and sometimes elicited only after coughing. In doubtful cases it is recommended to have the patient make a forcible expiration, then to cough, and finally to take a deep inspiration in order to produce râles.

Not only should the apices be most carefully studied but also the other parts of the chest, as the axillæ and bases anteriorly and posteriorly, the latter particularly for diminution in the respiratory excursion and for slight evidences of fluid.

The X-Ray.—The *x-ray* in spite of all its limitations can at times be of great service if the operator is efficient and the clinician competent, and if they have considerable experience in interpreting plates. While in some doubtful cases the *x-ray* will furnish no additional information, and may actually fail in rare instances to reveal a lesion which is the source of tubercle bacilli in the sputum, it may again disclose a focus unrecognizable by ordinary physical signs, as well as show an extent in the process which previously could at the most only be guessed at. Particularly in deep-seated lesions around the roots of the lungs is this method useful. The *x-ray* findings may, in conjunction with other facts, help to establish the pathology of the lesion. Absolutely negative findings are rather against the diagnosis of pulmonary tuberculosis if the other evidences are also prevailing negative.

In line with the general purposes of this paper which is presented more as a guide to method in trying to arrive at a diagnosis of early tuberculosis than with the object of exhaustively handling the subject or any portion of it, it seems best at this point to consider cases for diagnosis according to certain groups, a few especially significant groups being selected for this purpose.

The Upper Respiratory Tract.—The group of cases which naturally offers itself first for our consideration is that in which respiratory symptoms, such as slight cough and expectoration continuing beyond the ordinary period of a cold, predominate. After the history and symptoms, thoroughness in examination will be the first indication directed primarily to the upper respiratory tract. One looks for sources of obstruction that may indirectly cause cough, for local sources of inflammation, for infected areas that may not only lead to coughing, either directly or indirectly, but may also give rise to slight grades of toxemia with symptoms suggesting tuberculosis, and for various other abnormalities. The nasal passages and accessory chambers, the pharynx, the tonsils, the teeth, the gums, and the larynx and trachea should be religiously inspected. Unsuspected sources of hemorrhage may be revealed in this way. The induration of the apex developing as a result of obstructed nasal breathing, 'collapse induration of the apex,' has been reported but is not as yet a generally accepted condition. Inquiry should be made into possible external sources of irritation, such as coal

dust, wool dust, metallic dust, irritating vapors and tobacco smoke, which may seriously disturb the mucous membranes both of the upper and the lower respiratory tracts. On the other hand, chronic inflammatory conditions of the upper respiratory tract will often be found to be associated with definite pulmonary lesions.

The Lungs.—In the lower respiratory tract the difficulties are enhanced because the physical signs may be incapable of telling us whether a lesion is tuberculous, or, if so, whether it is in an active state, or whether tuberculosis and some other disease in the patient coexist. Of the intrapleural affections two seem specially worthy of note: pleural effusions which may be small and situated at the lower portion of the chest, and empyemata, which if interlobar or basal and small in amount may with great difficulty be revealed, while at the same time producing symptoms, if long continued, much like those of tuberculosis. It may be well to caution against a diagnosis of chronic pleurisy without making every effort to determine its etiology. Within the lungs a condition that quite often presents etiological difficulties is chronic bronchitis. We should bear in mind that this condition is usually bilateral and general in contrast to being localized to some portion or portions of the lungs, and that it occurs uncommonly as an idiopathic condition, and is relatively infrequent under forty years of age. Special warning should be given against attributing too readily a small hemorrhage or a slight streaking of the sputum to a simple bronchitis. Asthmatic symptoms, especially if associated with marked wasting, may give rise to diagnostic perplexities, particularly if both asthma and tuberculosis coexist. In the writer's experience, however, the cases in which true essential asthma is present, that is cases with typical asthmatic symptoms and signs, and with Curschmann's spirals and eosinophilia in the sputum, and responding to treatment with adrenalin, do not often present definite evidences of active tuberculosis. Whooping-cough in its early stages may cause uncertainty. Riesman* has described an interesting lobar form of bronchopneumonia of long duration, occurring in children and young adults, affecting chiefly the left lower lobe, associated with cough and continued low fever, which he believes is often overlooked because of failure to examine the lower posterior aspects of the chest, and which he feels convinced is often wrongly diagnosed as tuberculosis. Sometimes it is very difficult to tell whether an apical process is a pure anthracosis or whether tuberculosis is also present. Syphilis of the lung, though comparatively rare, is a possibility, but with the Wassermann test this diagnosis is less difficult than formerly. Malignant disease may make its first appearance at the apex. In this condition some of the symptoms may seem to be out of proportion to the physical signs, such as the dyspnea, while others may seem relatively slight like the expectora-

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tion and fever. Secondary anemia of severe grade points rather to malignancy. The rapid appearance of cachexia and loss of weight may be of some assistance in malignant disease. The age is not of as much value as generally supposed, because tuberculosis is relatively very frequent in persons from fifty to seventy-five years of age. Diminution in vocal fremitus and resonance and in the breath sounds with a very dull percussion note suggests malignancy. The sputum, the supraclavicular glands, and the *x*-ray may help in the diagnosis. Malignant disease elsewhere should be sought for. Streptococcal and influenzal apical infections, actinomycosis, streptothricosis, aspergillosis, disease due to the distomum pulmonare and other affections of the lungs are to be borne in mind. In general, it may be said, if pulmonary conditions, even when limited to the apices, persistently fail to exhibit tubercle bacilli in the sputum, while the symptoms continue or actually become aggravated, it may be well to make a renewed search for some less common cause for the affection. Diseases outside the lungs should be investigated in doubtful cases to explain respiratory symptoms and signs, for example heart and kidney diseases, an enlarged thyroid or thymus gland, enlarged bronchial glands, aneurysms and mediastinal growths.

Circulatory Phenomena.—Circulatory phenomena are common manifestations of the toxemia of tuberculosis, but unfortunately for the diagnosis of that disease also occur in many other conditions which in their early stages resemble tuberculosis. Palpitation may be present, but far more common is an increase in the pulse-rate. This, while often a very delicate and very useful index of activity, may also be a very unreliable one, as the heart rate readily responds to a great variety of different stimuli. It is well to recall that a normal pulse-rate is consistent with active tuberculosis. Vasomotor disturbances, though manifold in their etiology and often beyond our powers to diagnose satisfactorily, should always direct our thoughts toward the possibility of tuberculosis. Low blood-pressure readings are common in early tuberculosis, but are not constantly found; however, they should always make one suspect tuberculosis if no more satisfactory explanation can be demonstrated. Low grade toxic conditions in endocarditis, and hemoptysis of cardiac origin, are to be thought of in doubtful cases.

Abdominal Cases.—A group of symptoms fairly common in early tuberculosis are the abdominal; and one may have to tread very circumspectly to avoid being misled into a diagnosis either of tuberculosis or gastro-intestinal disease if the opposite condition is at fault. Especially when there is marked emaciation in association with an abdominal affection, such as visceroptosis, is the patient apt to present a tuberculous picture. A very common condition is the markedly relaxed abdomen often associated with wasting that occurs in women leaving childbed and returning to work too early,

which, with a slight cough, may furnish a picture very suggestive of tuberculosis. Even chronic constipation may present symptoms often found in this disease. Recently a patient was referred to the Phipps Institute Dispensary supposed to be suffering from tuberculosis but all of whose symptoms were referable to a tape-worm. Pain in the epigastrium and also elsewhere in the abdomen may be the result of pulmonary tuberculosis. The possibility that a questionable pulmonary hemorrhage may in reality have a gastric origin is worth remembering.

Gynecological Conditions.—Tuberculosis is well known to be a frequent cause of gynecological symptoms, and is one of the commonest causes of irregularity in the menstrual function apart from purely local conditions. Diminution or an entire cessation of the flow, excessive bleeding, vicarious menstruation, irregularities in the time of appearance, and dysmenorrhea are all liable to occur. Sometimes an abnormal rise of temperature about the time of the onset of menstruation is a manifestation of tuberculosis. Where no extra-pelvic disease can be definitely charged with the responsibility of these menstrual irregularities in a patient presenting evidences suggestive of tuberculosis, a gynecological examination may reveal a small uterus and stenotic os, which not only in part explain the pelvic symptoms but are associated with other indications of imperfect development often simulating tuberculosis. Leucorrhea, likewise, may be due to pulmonary tuberculosis.

Miscellaneous Symptoms.—There is a large group of symptoms found both in tuberculous and non-tuberculous conditions of particularly indefinite character, sometimes occurring alone, at others mixed in a most confusing way, which for the sake of brevity will be grouped together. The writer refers, for example, to various nervous phenomena, to disturbances of the vasomotor system, to anomalies in the function of the thyroid, adrenal and other ductless glands, and to imperfections in development, both physical and mental, that may lead to the utmost difficulties in diagnosis. Thorough work with definite searching investigation along these various lines, and continued study of these cases will be our greatest assistance in overcoming the difficulties. If the patient's condition has long remained unchanged, if the temperature, pulse, respiratory symptoms, tuberculin test and x-ray do not indicate tuberculosis, this diagnosis may be questioned even if other suggestive evidences like subnormal weight are present. In some obscure cases with resemblances to tuberculosis and with thoracic symptoms like pain but with no demonstrable pulmonary involvement, a Wassermann test may clear up the case.

The Social History and Habits.—In dealing with patients who are only slightly ill, in whom incipient disease of some sort, possibly of a tuberculous origin, is suspected, but cannot be definitely established, it is often well to revert to the patient's social history and

habits to discover if in this direction any hidden source of poor health can be brought to light. The subject of the special features exhibited by tuberculosis at different ages will not be discussed here. The writer, however, wishes to emphasize particularly the importance of being on the lookout for tuberculosis in older people, an attitude supported by two very good reasons. In the first place, if we compare the number of persons dying of tuberculosis at different age-periods with the number of persons living at each such period, we find that the tuberculosis mortality between the ages of sixty and eighty for both sexes considerably exceeds that of any other age period of twenty years, a fact conclusively established by Cornet, though apparently not generally appreciated. In the second place, the diagnosis in older people is apt to be more difficult because the evidences of toxemia may be comparatively slight, the physical signs less definite, and other chronic pulmonary affections more prevalent. Among important etiological factors in a patient's social history and habits, some may fail to be mentioned simply because the patient has not realized their importance, others may have to be extracted from an unwilling person by the employment of much patience and tact. The patient's mode of life, the amount of sleep obtained, the character and duration of his work, his dietary habits, the possibility of prolonged lactation or frequent child-bearing in women, the hygiene of the home and the amount of fresh air obtained day and night, the responsibilities and worries that may be oppressing the patient, injurious indulgences in coffee, tea, tobacco, and alcohol, sexual excesses—investigations along these lines may expose etiological factors that are removable, and with them all evidences of disease. In hospital and dispensary work many of these points are only cleared up by the social visitor through her investigation of conditions at the patient's home.

Little has been said for lack of space about the diagnosis of tuberculosis in association with other diseases, for instance, syphilis or diabetes, or about the important subject of the determination of the degree of activity of the tuberculous process, or about what should be done for doubtful cases. As to the last point, our mental attitude can be fairly definite, if we frankly admit our limitations for making a scientific diagnosis, but fully realize our obligations to a patient whom we suspect of having one of the most prevalent and frightful diseases, even though scientific demonstration for its existence be lacking. If, after our best efforts with every advantage for making a diagnosis available, the patient reveals suspicious but not positive manifestations of tuberculosis, treatment directed towards this disease should be instituted, or at least the patient should be kept under the closest observation. In the case of free sanatoria for which money is expended solely for the treatment of tuberculosis, we should take every precaution to withhold

patients that are not tuberculous, but it is certainly true that most of the cases of poor health without definitely assignable cause do wonderfully well at these institutions. The writer has been particularly interested to watch the behavior of a number of patients, under observation for a year or more and giving no positive evidences of any single malady, improve wonderfully in their general health through taking treatment at a tuberculosis sanatorium. These good results may be considered to add some evidence in favor of a diagnosis of tuberculosis. Patients of an apparently similar type originally if failing to respond to sanatorium treatment and showing no new evidence of tuberculosis are probably suffering from some other condition. In this way we have a very modified form of therapeutic test, which also operates to a certain extent when a case of doubtful diagnosis responds to some non-tuberculous line of treatment.

While certain points in differential diagnosis have been touched upon in this discussion, the writer's particular aim has been to emphasize the fact that success in so complex a field of endeavor can only be acquired by proper preparation, coupled, even in the case of the most experienced, with thorough and painstaking study of individual cases, and to try to indicate in a general way a method of procedure of help in developing one's efficiency in the differential diagnosis of tuberculosis.

A METHOD TO DECREASE THE FREQUENCY AND MORTALITY OF TUBERCULOSIS.

By JULIUS ROSENBERG, M. D., of Margaretville, Del. Co., N. Y.
and New York City.

The object and scope of this essay is to ascertain (1) the death-rate from pulmonary tuberculosis at the present time and in preceding years. A comparison of these figures will demonstrate what results and benefits (if any) have been obtained from the anti-tuberculosis campaign. Since in many states and cities the report of cases is very inaccurate, and general tuberculosis, tuberculous meningitis, tuberculosis of the joints are not classified, they are not included in the report. Investigation of the prevalence of tuberculosis among cattle and its probable influence upon tuberculosis infection; (2) to ascertain what efforts are made to exclude this source of infection; (3) to recommend a method which removes the danger from cattle infection; (4) to advise a method combining preventative and curative influence.

The discovery of the tubercle bacillus by Koch in the year 1882 marks an epoch, the beginning of a new era, medicines emerging from the chrysalis of empiricism into a science based upon investigation and search for truth and facts.

The genius of a Koch, Pasteur, Klebs, and many other master minds of that wonderful period, rent the veil of mystery, exposed Nature's long hidden secrets. Discovery followed upon discovery, research revealed the cause of many diseases, and Lister's method of antiseptics laid the corner-stone and foundation for modern surgery.

The widely prevailing idea, that Koch's discovery inaugurated at once the antituberculosis campaign, is erroneous. The warfare against the disease, now general throughout the world and without a parallel in history, is of comparatively recent date; little was done prior to 1907. New York was a singular exception. As early as 1894, Dr. Herman Biggs, one of the foremost sanitarians, inaugurated methods for the purpose of disease prevention which have since been copied in almost every city of the land, even beyond its shores. The results were a decline in the death-rate, from all causes, and incidentally from tuberculosis. There is a general misconception in regard to results obtained from the anti-tuberculosis campaign; statements prophesying control of the great White Plague in the very near future as effectually as we control smallpox to-day are only misleading conclusions not based upon facts.

The writer is well aware of the splendid work and service by public and private organizations, but existing conditions are not such as to warrant the optimism and assurance constantly met with. It is his endeavor to show the naked truth and facts, what results are found after many years campaigning, to discover the neglected opportunities, and advocate methods which he believes will be of material help.

To show the former and present condition of morbidity and mortality the writer appends official report from a number of states and cities, received in response to his request for information directed to almost every state and large city in the United States. The reports are sufficiently numerous and represent various sections of the country and types of the city and afford correct information.

New York State.

<i>Population</i>	<i>Year</i>	<i>Pulmonary Tuberculosis</i>	<i>Deaths per 100,000</i>
7,200,000	1900	13,591	186
7,400,000	1901	13,766	
7,500,000	1902	12,582	
7,700,000	1903	13,194	
7,900,000	1904	14,158	170
8,000,000	1905	14,059	
8,200,000	1906	14,027	
8,400,000	1907	14,406	
8,500,000	1908	14,316	
8,600,000	1909	13,996	155
9,100,000	1910	14,059	
9,300,000	1911	14,205	151

Michigan.

	1900	2,220	91
	1901	2,340	95
	1902	2,180	88
	1903	2,310	92
	1904	2,510	99
	1905	2,460	96
	1906	2,500	96
	1907	2,510	95
	1908	2,512	95
	1909	2,470	92

Michigan's decennial decrease is trifling, but the death-rate of 90 compares well with the 160 deaths per 100,000 in the State of New York.

While in the State of Maine the death-rate from tuberculosis is about the same among both sexes, and in New York City 5,800 males to 3,100 females, in Michigan out of 30,000 cases in fifteen years, 14,000 males died and 16,000 females.

North Dakota.

<i>Population</i>	<i>Year</i>	<i>Deaths</i>	<i>Per 100,000</i>
500,000	1909	187	37.4
	1910	155	31.2
577,000	1911	232	40.2
	1912	215	37.2

The State built a sanatorium for tuberculosis in 1910, spending \$50,000, and provided an annual appropriation for maintenance. The State has the usual preventative laws against spitting, drinking cups, etc. The above figures are not indicative of a changed condition.

Maine.		
<i>Year</i>	<i>Deaths</i>	<i>Per 100,000</i>
1901	1,033	
1902	970	
1903	901	
1904	1,016	135
1905	894	
1906	915	
1907	950	
1908	893	123
1909	839	113
1910	889	120
1911	842	125
1912	780	117

These figures show a progressive improvement due mainly to a decrease in the rural districts.

California.			Wisconsin.		
<i>Year</i>	<i>Pulmonary Tuberculosis</i>	<i>Deaths per 100,000</i>	<i>Population</i>	<i>Year</i>	<i>Tuberculosis</i>
1908	4,040	129	2,300,000	1908	2,509
1909	3,945	126		1909	2,546
1910	4,061	131	2,400,000	1910	2,404
1911	4,161	128		1911	2,405
1912	4,353	128			

The death-rate of children under one year averages 20 per cent., and the general death-rate for meningitis averages 450 cases. Meningitis is now believed to be mostly of tuberculous origin.

The health reports contain no investigations of dairies. The report states, "the mother should see that the milk is from healthy cows and clean dairies, etc." The writer believes the health officers give their assistance by investigating the dairies and excluding milk from diseased cattle and dirty dairies. The advice to the mother is of no value, she being unable to carry it out.

New Hampshire.	
1908	471
1909	466
1910	479
1911	433

The legislature of 1911 passed a concurrent resolution authorizing the governor to appoint a commission to consist of five *competent persons* to investigate the subject-matter of tuberculosis and

recommend a comprehensive plan to control or to prevent the spread of the disease, etc.

The governor of New Hampshire, for reasons only known to himself, appointed not a single physician as a member of the commission. He no doubt believes that a butcher, baker and candlestick-maker are best qualified to investigate the subject-matter of tuberculosis and how to control and prevent the spread of the disease. While political expediency influences appointment and investigation of sanitary conditions, the results are of no special value. The New Hampshire Commission's report is barren—it compares the statistics of the year 1882 with 1912 and discovers a wonderful improvement in the death-rate from tuberculosis and all causes. The decline of deaths from tuberculosis in 1908—471 and 433 in 1911—is caused by a lower mortality in the years between forty and eighty—namely, 1908, 181; 1909, 168; 1910, 203; 1911, 155. The death-rate in the years between twenty and forty remains the same—1908, 221, and 1911, 216.

The figures show no decided change in the tuberculosis death-rate.

Binghamton, N. Y.

<i>Population</i>	<i>Year</i>	<i>Deaths</i>
45,000	1908	73
48,000	1909	54
48,000	1910	73
50,000	1911	65
50,000	1912	63

This city has a sanatorium, physician and nurse to look after poor consumptive patients in their homes. The death-rate shows no influence from the anti-tuberculosis campaign; many advanced cases are sent to the State Hospital.

Indianapolis, Ind.

<i>Population</i>	<i>Year</i>	<i>Deaths</i>
233,000	1908	399
239,000	1909	382
233,000	1910	397
240,000	1911	363
260,000	1912	359

The decrease from 160 per 100,000 to 140 in 1912 represents the average improvement.

Worcester, Mass.

<i>Population</i>	<i>Year</i>	<i>Deaths</i>
145,000	1910	148
156,000	1911	153
160,000	1912	150

This is an exceptionally low average—about 100 per 100,000. There are, however, a number of deaths occurring in the state in-

stitutions which do not appear in the city statistics and would probably increase the percentage to the average 140 per 100,000.

New Haven, Conn.

<i>Population</i>	<i>Year</i>	<i>Deaths from Tuberculosis</i>	<i>Death-rate per 1,000 from all causes</i>
135,000	1910	183	164
137,000	1911	137	166
140,000	1912	163	166

The reports of 1911 and 1912 urge more strenuous laws against the dairy farm and advise exclusion of milk, except from cows tested and found free from tuberculosis. 8,000 cows were tested—20 per cent. reacted and 12 per cent. were found badly diseased and were destroyed.

Boston, Mass.

<i>Death-rate, All Causes, per 1,000</i>	<i>Year</i>	<i>Tuberculosis</i>	
17.88	{ 1908 1909 1910	{ 1,094 1,072 1,163 }	Average per cent. 1.7
17.08	1911	1,067	
16.17	1912	1,093	

The tuberculosis mortality's decline averages that from all causes.

Hartford, Conn.

<i>Population</i>	<i>Year</i>	<i>Deaths</i>	
	1908	179	Prior to opening of State Sanitarium.
	1909	126	
	1910	174	
98,000	1911	139	
100,000	1912	102	
102,000	1913	116	

The health officer referring to the decrease in number of deaths as compared with 1910 writes: "The figures of 1911-12-13 should not be compared with 1910 and preceding years, on account of the opening of the State Sanitarium in 1911, for they show many advanced cases outside the city which in past years came to the hospitals for treatment.

Los Angeles, Cal.

<i>Population</i>	<i>Year</i>	<i>All Causes</i>	<i>Tuberculosis</i>
275,000	1908	3,828	689
300,000	1909	3,753	666
300,000	1910	4,872	790
350,000	1911	5,267	906
400,000	1912	6,116	1,012

Tuberculosis increases in proportion to increase of population and general death-rate. It is unusually high, due to the increasing number of patients from outside seeking health in the California coast.

Providence, R. I.

<i>Population</i>	<i>Year</i>	<i>Deaths</i>
225,000	1908	403
	1909	416
to	1910	394
	1911	371
230,000	1912	336

The report of 1912 states since 1910 the number of residents of Providence dying outside the city has been increasing, therefore the number of deaths from tuberculosis is misleading, as large numbers of the poor in advanced stages of consumption are sent to state institutions at Howard.

Chicago, Ill.

<i>Population</i>	<i>Year</i>	<i>Deaths</i>
2,195,000	1909	3,885
2,240,000	1910	3,726
	1911	3,750
2,294,000	1912	3,726

The above shows the annual fluctuations—no decisive change noticeable.

Columbus, Ohio.

<i>Population</i>	<i>Year</i>	<i>Deaths</i>
185,000	1908	302
	1909	256
	1910	316
188,000	1911	287
	1912	281

The death-rate is lower in 1909 than in 1912. The tuberculosis rate is not changed except that in 1910 it was uncommonly high.

St. Louis, Mo.

<i>Population</i>	<i>Year</i>	<i>Deaths</i>
732,000	1909	1,094
735,000	1910	1,203
698,000	1911	1,075
687,000	1912	933

The decline in number of deaths is due to decrease in population. The 1912 report referring to the examination of cows and dairies discloses an unusual condition. "The examination of our local dairies containing 26,400 cows shows not a single tubercular cow . . . and the general health condition is excellent." (This is justified if true.)

Nashville, Tenn.

Population		Year	Tuberculosis
110,000			
White 75,000	Colored 38,000		
Deaths	Deaths		
111	120	1909	211
99	120	1910	231
90	129	1911	219

Although the white outnumber the negroes almost two to one, the number of negroes dying from pulmonary tuberculosis is 20 to 30 per cent. higher. There are also twice as many deaths from pneumonia among the negro population of Nashville—139 negroes against 73 whites in 1910 and 130 negroes against 76 whites in 1911.

These figures illustrate the danger from insanitary conditions and disregard of the first principles of cleanliness. The city employs medical inspectors and district nurses to attend patients at their homes and to enforce sanitary laws. There is surely need of this, and many more should be appointed. The Nashville Board of Health represents the type of what the writer calls 'unjustified optimism.' The 1911 report closes with the following sentence: "We feel justified in viewing the tuberculosis problem with more optimism and look 'confidently' to the future." (Why?)

The mortality rate from all causes remains the same and that from tuberculosis is not lower. The disproportion and high mortality from tuberculosis and, among the negro inhabitants from pneumonia, is surely not an indication of perfect sanitation. Instead of 'looking confidently to the future,' the Health Board of Nashville had better look for violation of their rules (efficient on paper), useless until enforced.

Lowell, Mass.

Population	Year	Deaths
106,000	1910	117
106,000	1911	114
106,000	1912	119

This does not include deaths in the state sanatorium. The low mortality of 110 per 100,000 is doubtless thus explained.

New York City.

1900	8,100	Decennial average 8,300.
1901	8,100	
1902	7,600	
1903	8,000	Corrected decennial average.
1904	8,500	
1905	8,500	
1906	9,000	To correspond with increased population 10,600.
1907	9,000	
1908	8,900	
1909	8,600	A decrease in deaths 1,900 in eleven years, about 20 per cent.
1910	8,700	
1911	8,800	

During the same period the deaths from all other forms of tuberculosis decreased from 1,670 to 1,470, about 12 per cent. These cases consist mainly of meningitis and intestinal tuberculosis in children under five years of age.

City	1908	1909	1910	1911	1912	Population
Providence.	403	416	394	371	336	230,000
Indianapolis.	399	382	397	363	359	260,000
Los Angeles.	689	666	790	906	1,012	400,000
Boston.	1,094	1,072	1,163	1,067	1,093	710,000
Binghampton.	73	54	73	65	63	50,000
Columbus.	302	256	316	287	281	188,000
	2,960	2,846	3,133	3,059	3,144	
1908 {	45,000				50,000	
	275,000				400,000	
	235,000				260,000	
	225,000				230,000	
	185,000				188,000	
	650,000				720,000	
	1,615,000				1,848,000	
1,615,000=2,960					1,848,000=3,144	

City	1910	1911	1912	Population 1910	1912
Binghampton.	73	65	63	45,000	50,000
Columbus.	316	287	281	185,000	188,000
Chicago.	3,726	3,750	3,726	2,200,000	2,300,000
Nashville.	239	219	220	110,000	110,000
Providence.	394	371	336	225,000	230,000
St. Louis.	1,203	1,075	933	732,000	687,000
Indianapolis.	397	363	359	233,000	260,000
Los Angeles.	790	906	1,082	300,000	400,000
Hartford.	102	110	116	98,000	102,000
Boston.	1,163	1,167	1,093	670,000	710,000
New Haven.	183	137	163	135,000	140,000
Worcester.	148	153	150	145,000	160,000
Lowell.	117	114	119	106,000	106,000
	8,751	8,717	8,641	5,184,000	5,443,000
168—100,000—8,751		160—100,000—8,641.			

City	1909	1910	1911	1912	Population 1909	1912
Binghampton.	54	73	65	63	45,000	45,000
Columbus.	256	316	287	281	275,000	188,000
Chicago.	3,885	3,726	3,750	3,726	2,200,000	2,300,000
Nashville.	211	239	219	220	110,000	110,000
Providence.	416	394	371	336	235,000	240,000
St. Louis.	1,094	1,203	1,075	933	715,000	687,000
Indianapolis.	382	397	363	359	185,000	260,000
Los Angeles.	666	790	906	1,012	198,000	400,000
Hartford.	138	102	110	116	98,000	102,000
Boston.	1,072	1,165	1,067	1,093	735,000	770,000
	8,174	8,405	8,214	8,139	5,368,000	5,102,000

State	1908	1909	1910	1911	1912
Maine.	893	830	889	842	780
California.	4,040	3,945	4,061	4,161	4,353
Dakota.	190	155	232	230	215
	5,123	4,930	5,182	5,233	5,348

<i>State</i>	<i>1908</i>	<i>1909</i>	<i>1910</i>	<i>1911</i>	<i>Population</i>
New York.	14,316	13,996	14,059	14,205	9,113,279
Wisconsin.	2,509	2,546	2,404	2,405	2,333,860
New Hampshire.	471	466	479	433	430,572
California.	4,040	3,945	4,061	4,355	2,377,549
Maine.	893	830	889	842	742,371
North Dakota.	180	187	155	232	577,056
	22,409	21,968	22,047	22,472	

Pulmonary Tuberculosis Annual Death-Rate per 100,000 Persons Living in the Principal Cities of the World.

	<i>1906-1910</i>	<i>1910</i>	<i>1911</i>
London.	140	123	135
Edinburgh.	125	110	109
Glasgow.	154	138	132
Montreal.	176	172	175
Paris.	374	346	366
Amsterdam.	138	130	135
Berlin.	179	176	168
Hamburg.	142	125	132
Vienna.	277	261	266
New York.	197	180	181
Chicago.	161	162	165
Boston.	176	166	155

These figures show no change, except the usual fluctuations. The world-wide crusade gives no evidence of success.

The reports and tabulations disclose the actual conditions as they exist throughout the world and especially in the United States. The figures for 1913 are not included, not being available, but judging from incomplete reports in the writer's possession, their addition would not have altered the results.

It must be admitted that their most liberal interpretation would not warrant the optimistic, misleading (one is tempted to write irresponsible) statements flooding the medical and lay literature. Where is the evidence to justify the prophesy "the end of tuberculosis is in sight"? Upon what facts did the Local Government Board of London base the conclusion (published in the *New York Times*, January 23rd, 1914): "Consumption will disappear," and that "the disease continues to decrease in the great centres of population—London, Manchester, Liverpool and Edinburgh"? The writer refers to the reports from these cities which present no evidence of changed conditions.

Such statements mislead, are harmful, creating confidence and a feeling of assurance in what is done, not justified by past achievements or prospects of the future. Instead of "a marked decrease everywhere," the death-rate continues unchanged, perhaps a fractional decline in a few cities, which may be the result of a shifting from city to state institutions.

Reports from New York show what can be attained by the present methods, and the same results will be attained (in time) in other

cities and states. The anti-tuberculosis crusade has accomplished much good; it has improved the general tone—physical and moral health, but it can no more eradicate tuberculosis than smallpox and diphtheria could have been vanquished by frequent baths and gargling with mouth-washes; the clipping off of a fraction—a few deaths less per 100,000 and no more.

Here the writer has tabulated the number of deaths from pulmonary tuberculosis in six cities with a total population of close to 2,000,000. In 1908 with a population of 1,615,000 there occurred 2,960 deaths, and a year ago with a population of 1,848,000 the number of fatalities grew to 3,144. Surely there is no cause for mutual felicitations. The other tabulations give the very same information—*statu quo ante bellum*.

The writer does not decry the methods in use nor criticise what has and is being done, but the results are surely disappointing. He always doubted the extravagant claims being achieved, but he was not aware that man barely held his own against the disease. He is not predicting failure, he believes the great White Plague will ultimately be controlled, but not by present means. Other weapons must be used; nothing discarded, but new armament added to strengthen the attack.

The education of the public in sanitation is of inestimable value—saves numerous lives, prevents disease. The recognition by men of all classes that spitting means danger to others and from others, the abolition of roller towels and common drinking cups is beneficial, but more so that their enforcement is possible. It proves the people are *en rapport* with the problems of the day; they are recognizing the fact that it is easier to prevent illness than it is to cure it, a fact known to the Chinese for centuries. In China the physician receives a salary for keeping the people well, but he has to work gratuitously in case of sickness. The writer remembers the time (it is not so long ago) when this was considered ridiculous; it is different to-day.

But what can we do to lessen the devastation of the world by consumption, what means are in sight to help us? Park and Krumwiede's research, relative to the importance of the bovine and human types of tubercle bacillus (collected statistics from the Research Laboratory Department of Health, City of New York, Vol. VI, 1911), states, "the results of the examination of various cases (Vol. V) showed conclusively that infection with bovine tubercle bacilli is essentially a disease of children, and a serious menace to life in infants."

Until Koch startled the Tuberculosis Congress in London in 1892 with the dictum, "Bovine tuberculosis does not produce serious infection in man and is comparatively seldom," the tuberculous cow was feared and its milk and meat excluded if known. The Tuber-

culosis Commission appointed by the London Congress investigated the subject of bovine tuberculosis and disagreed with Koch.

Many other authorities found evidence of cattle infection, yet the idea that bovine infection is not a menace to life has gained a foothold, and little care is exercised to exclude the product of the consumptive cow. The spitting man is feared as a poisonous serpent, but milk alive with tuberculous germs is admitted to the house and nursery and no questions are asked. The roller towel and rusty cup had to go—the diseased cow remains undisturbed, spreading infection to animals and man until life's end.

Alfred Hess,* while studying the New York milk supply, found that "of 106 specimens of milk tested on guinea-pigs, 16 per cent. contained virulent tubercle bacilli." Hess observed the effects of raw milk upon young children and found that out of eighteen children ranging from five months to five years, one died from pulmonary tuberculosis, while four gave positive reaction to the von Pirquet test. A few of the children with negative reactions looked bad, were poorly nourished, and no doubt fell victims to tuberculosis.

Recent investigations demonstrate the extensive infection of young children, some placing the figure as high as 96 per cent. (Behring). It has been shown that many supposed cases of epidemic cerebrospinal meningitis are tuberculous meningitis. The patients are usually under two years of age, although it is not uncommon in later life. Sophian** reports 112 cases of supposed epidemic cerebrospinal meningitis. Of these, 25 were correctly diagnosed, 26 were tubercular meningitis, and the balance were found to be some other condition: bronchopneumonia, suppurative meningitis, anterior poliomyelitis, etc. Park and Krumwiede, above referred to, found 55 cases of tuberculosis in children of five to sixteen years—46 human tuberculosis and 9 due to bovine bacillus—and in children under five years of age, 91 human infection and 25 bovine tuberculosis. The latest report from the New York Board of Health states, among other things, that "a careful study of the amount of tuberculosis in New York is in progress, and at the present time the total amount of bovine infection can only be roughly estimated."

Many cases of tuberculosis in infants are not reported correctly. "The majority of cases dying during the past two years of meningitis (supposedly meningococcus infection) are really tuberculous in character." 15 per cent. of the bronchopneumonia cases are tuberculous meningitis. "The deaths from tuberculosis due to milk are estimated at about 300 yearly." This estimate is much too low. The writer believes 1,500 deaths would be nearer the truth. There occur in New York, according to the latest report, 1,600 deaths from simple meningitis, and 1,000 cases of tuberculous

**Journ. Amer. Med. Assoc.*, p. 1011, 1909.

**Research Laboratory Dept. of Health, City of New York, Vol. VI, 1911.

meningitis, altogether 2,600 cases of meningitis. A conservative estimate would class 20 per cent. due to bovine tuberculosis—namely, 520 cases, and adding to these other forms of tuberculosis—intestinal, bones and joints, etc.—1,500 cases of bovine infection would not be too high a figure.

How extensive the infection of dairy cattle is can be seen from some of the reports in the writer's possession. Washington, D. C., Rochester, N. Y., and New Haven, Conn., found milk tests to give positive evidence of tuberculosis in 20 per cent. of the specimens. The Health Department of Boston estimates the percentage of tuberculous animals producing the city milk supply from 20 to 25 per cent. The number of cows in the city's abattoirs average 5,000 per annum, and of these about 1,000 (20 per cent.) are found to be unfit for consumption.

According to government reports, the State of Kansas has 722,000 dairy cows and estimates the percentage of tuberculous animals to be not less than 100,000 (15 per cent.).

The New York State Report of 1911 contains statements disclosing conditions beyond description, which but for the source of information would not be accepted as true. The health officer of Buffalo, after discussing the city milk supply and the efforts to improve it, states that there is no diminution of tuberculosis and the state's effort in elimination is negligible. He finds the market at all times flooded with tuberculous animals to be slaughtered for sausage, and some shipments averaged as high as 75 per cent. of tuberculosis.

Here are facts evidently overlooked in the anti-tuberculosis crusade. Because of Koch's statement, the tuberculous cow became immune, and the bovine bacillus had entrée into the best houses. Let the rich man not be confident of his safety because he pays 12 cents or 15 cents per quart. Milk is not the only source of infection, butter and even cheese provide the means to gain admission.

It is high time for physicians and the people to recognize conditions as they are, and that the mortality from tuberculosis is about the same and with no prospect of improvement.

Let the crusade extend to the cow—abolish bovine tuberculosis—it must go like the roller towel and the drinking cup. By putting an end to the tuberculous cow (other animals, swine, etc.), a potent source of infection is removed. Whether the decrease be 10 per cent. or 20 per cent. will not be known until the eradication of the diseased animal. Whatever the result, it is a gain, and surely a step in the right direction.

By what means and measures can the tuberculous cow be exterminated and new infections prevented? For the past two years the writer has studied the immunizing of animals, especially cows and goats against tuberculosis, and evolved a simple, safe and certain method. It involves no risk to animal life or to health, no risk

from temporary sickness, and immunity is established within two weeks. Before inoculating, the tuberculin test is used, and if sick the cow must be segregated or destroyed.

The preparation of the vaccine is complicated and cannot be made by ordinary laboratory methods nor equipment. The writer is negotiating with a firm of the highest reputation to undertake the production and supply of the vaccine. The immunizing of cows against tuberculosis should be compulsory, like the vaccination of man against smallpox. It would be well to have the State supervise it.

Immunizing the cow against tuberculosis induces also the protection of the calf. The vaccination of the cow is followed by the production of antibodies, present not only in the blood-serum but also in the milk. That certain diseases could be transmitted from parent to offspring has always been a moot question. Since exact methods have been discovered it can be demonstrated that the young cow gains immunity from the immune mother. There is a passage of specific antibodies to the fetus before birth (not always) and further through the milk to nursing offspring after birth.

The writer has proved the transmission of immunity in a number of cases,* and he is about to report another series of observations too detailed and too long to include in this essay.

The passive immunity acquired by the young protects it until active immunity can be conferred by inoculation.

Still another advantage from immunity of the cow is the transmission of passive immunity to the human consumer of milk. By continuing the inoculation for an extended period (two months) the milk acquires highly protective powers—antibodies of all kinds being present in high concentration.

The absorption of antibodies by way of the alimentary canal has been proved by numerous observers, besides the writer. The failures are owing to the deficiency in antibodies in the milk (inoculation being insufficient), and the time too short for them to appear in the blood. Ehrlich, Burkhardt and several authorities found conclusive evidence, and there is no doubt that antibodies can pass the intestinal mucous membrane unchanged. The immune bodies are similar to the plant and bacterial toxins, like ricin and tyrotoxin.

After examination of the preceding pages, who would not concede that the results of the anti-tuberculosis campaign are conjectural, and that the problem is far from being solved and eradication imaginary? The prevalence of tuberculosis in dairy and stock farm is admitted; the carrying of bacilli into the house, by contamination of milk, butter and cheese (also meat), a proved fact. Whether the ratio of bovine infection is 15 or 20 per cent. does not alter the

**New York Med. Journ.*, October 14th, 1913.

fact that the tuberculous cow must go. There can be no argument in favor of the slaying of infant life by the diseased cow.

It is the duty of every state and town first to discover the disease and destroy the sick cows, and then prevent new infection by preventive vaccination. Is it not better to prevent illness than to cure? Are we spending money wisely building hospitals for consumptives, while the source of infection continues and new cases result?

The writer trusts that he has succeeded in convincing the reader of the serious reality of the situation, so that his support may be enlisted in spreading the truth and correcting false statements that tuberculosis is decreasing. He hopes that the reader will agree that bovine tuberculosis is a menace, that the tuberculous cow can be eradicated, and that it is the duty of all to insist upon the immunization of cows. Inoculation of the cow guards against infection, and the milk, instead of a poison, acquires properties which will help the ill and protect the healthy.

Immunized milk is used in a number of hospitals and by private patients with good results, in some children with Pott's disease, tuberculosis of bone and joints, suppurating tuberculous glands, and in adults with pulmonary tuberculosis. The reports from the attending physicians are not complete, but the results appear to be favorable; patients, who were losing ground in spite of other treatments, have improved, have gained in weight, have a normal temperature—the condition in general being a better one. The use of immunized milk is free from danger. A complete report will appear within two months.

THE ACTUAL VALUE OF ARTIFICIAL PNEUMOTHORAX IN THE TREATMENT OF PULMONARY TUBERCULOSIS.*

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In order to place the lung of a tuberculous patient at rest, and also to immobilize it, the procedures which are employed are those which have been in use in surgery for a long time in the treatment of tubercular joints. This is the goal which the methods inducing pulmonary collapse must reach, whether the operation be thoracoplasty, artificial pneumothorax, or pleuroparietal detachment.

The impossibility of obtaining the sinking in of a cavity at the apex in any other way than by an extensive thoracoplasty, that is to say one that is fraught with danger and is mutilating, the untoward results following pneumotomy on account of the rigidity of the upper part of the thorax, led to the investigation of a means which would realize in a mechanical way pulmonary collapse and the obliteration of the cavity. Thus arose the operation of artificial pneumothorax with its two methods: The total intrapleural one extending throughout the pleural cavity, and the more logical partial extrapleural one combined with grafting or some sort of packing.

The idea of performing the operation of pneumothorax originated in the clinic, and as far back as 1888 Potain was the first to attempt a pneumothorax for therapeutic reasons. This method of treatment, which has been in constant use by physicians, has been the subject of such careful study by them that it is only necessary here to mention the essential points, the indications, and the results. At the present time this method, which had already been employed by Chassagnac for hemoptysis, is universally adopted. It was Forlanini,¹ in 1892, who rendered this operation easy of performance and devoid of danger, and the medical literature (nearly five hundred publications) contains articles almost daily which show the results obtained therefrom. Its principle is the compression of the pulmonary lesions so that circulatory and nutritive modifications at the niveau of the cavity are brought about, and above all the immobilization of the lung effected. The nitrogen formerly introduced after incision of the pleura (Brauer,² Murphy,³ Tuffier⁴) is at the

*Translated by N. H. B.

present time insufflated through a simple puncture, according to a carefully devised technique (the apparatus of Forlanini and of Kuess). For about two years the insufflations are repeated, the intervals being increased according to the length of time that has elapsed since the operation, and the number of insufflations controlled by the *x-ray* pictures.

A very difficult matter is to state at the present time just what indications are best met by this operation, since cases are so decidedly different; hence it would be better to mention the contraindications. In most patients who are in the first or second stage of the disease, who are suffering from the acute phase, who are febrile, pneumothorax should not be done, since fever is a decided contraindication and the risk is too great on account of the probability that in these circumstances the operation is very likely to lash into activity an acute inflammatory attack followed by granulations. Moreover, in the serious, advanced cases, where there are signs of pulmonary cavities, the operation should not be done.

In principle, pneumothorax is of service in unilateral tuberculosis, and in those cases in which the cavity is limited to the apical zone without pleural adhesions (this is a rare condition), in which the lesions are afebrile, or in which there is but a slight remittent fever. Artificial pneumothorax performed under these circumstances is of undoubted value, because it results in the collapse of the lung which causes the obliteration of the cavity and the close apposition of the walls necessary to cicatrization.

Unfortunately the combination of conditions which are favorable to this operation are rarely realized in a hospital, since the majority of patients whom we see there have very extensive bilateral lesions, are cachectic, have hectic fever, or have multiple cavities or adherent apices. Of course, in these cases the operation should not be attempted. And here it would be well to call the reader's attention to the fact that only a limited number of patients in a city present conditions favorable for the successful outcome of this operation. The greatest drawback that is most often encountered is pleural adhesions, especially at the apex, a region which the operator should endeavor to reach, and in which there are many cavities in close vicinity to the indurated walls, thus forming an obstacle to the pulmonary collapse which is the object of the operation. In fact, there are so many contraindications to this operation that its applicability is decidedly restricted, not only at present, but will be as regards the future. Besides the statistics collected by Zink,⁵ the results published by Forlanini,⁶ by Brauer and Spengler,⁷ by Schmidt,⁸ Rist, Rénon,⁹ in France, are particularly discouraging. In recent statistics Bernard¹⁰ published the following results: Of 628 tuberculous patients, only 23 presented favorable conditions for operation, and only in 6 instances was pneumothorax continued for a sufficient length of time; thus the method was applic-

able only in 3 per cent. of the cases, and very good results were observed only in 3 of the cases treated.

In connection with this operation, we shall describe the pleuro-parietal detachment, or 'pneumolysis' at the apex of the lung, followed by packing with organic or inorganic matter. This procedure has at least the advantage of immobilizing and compressing only the diseased region of the lung, and not interfering with the hematosis of the healthy region. This is a logical conclusion, but has not as yet been verified (Figs. 1 and 2).

Our method, as applied to tuberculous patients, reported before the Paris Surgical Society, May 2nd, 1910,* is the result of researches in the treatment of pulmonary cavities by extrapleural pneumothorax followed by grafting.

The space comprised between the ribs and the parietal pleura is at first located, followed and opened up for pathological processes themselves; it is in this location that deep cold abscesses develop arising on the pleural surface of the ribs. In this locality cold abscesses of true vertebral origin collect, and here also certain tuberculous mediastomata of septic and sclerotic nature have their origin.

In 1891, having had occasion to remove the apex of a tuberculous lung, after resection of the second rib, I [Tuffier] found myself face to face with an adherent pleura, and in order to bring the apex of the lung outside the chest wall, it was necessary to detach the pleuroparietal membrane from the inner surface of the ribs; it then occurred to me that the ease with which the pleuroparietal membrane was detached was the means of reaching the pulmonary parenchyma so as to explore, compress, or amputate the lung. In this way I realized that there was a new procedure for exploring the lung¹¹ so as to bring about a reduction in the number of hemorrhages and a method for extrapleural pneumothorax in the tuberculous; and finally I elaborated this method by filling the detached space with grafts,¹² in the treatment of certain suppurative or tuberculous cavities.

What differentiates distinctly our method of extrapleural pneumothorax from the method of Forlanini is this, that we immobilize the diseased pulmonary regions, while his method, intrapleural pneumothorax, immobilizes all of the lung except the diseased region. This appears to us to be a therapeutic mistake. Adhesions of the pleura in the region of the apex are the rule, and these were present in 8 out of 10 of our operated cases. The injection of azote into the pleura penetrates no further than its niveau, and consequently causes neither contraction nor immobilization of the diseased region. In this respect its use is greatly inferior to the operation which we have described.

*Tuffier (*Soc. de Chir.*, p. 537, 1910).

The post-mortem detachment of the pleuroparietal membrane is very difficult, but is much less so in the living, and an altogether simple procedure when the adhesions are between the two pleural surfaces. If the separation is carefully done in the living, there is no loss of blood, and it can be extended to the neighborhood of the hilus of the lung. The only difficulty encountered is where the two surfaces join in the posterior part of the pleura in the region of the vertebræ.

We have recently modified and perfected the operative technique; nevertheless, the greatest precaution is necessary during the different stages of this operation. For example, we shall take up now the detachment of the apex: An incision 6 cm. in length made in the second intercostal space, commencing within a fingerbreadth of the sternum, discloses the intercostal muscles. These are carefully divided, after inserting a grooved probe as deep as the posterior surface of the space. The pleura is then reached, and is very carefully detached before the retractor is put in place. We use a very strong toothed rack retractor made by Collin, of Paris (Fig. 3). At the bottom of the opening made by the forced retraction between the second and third ribs may be seen the exposed pleura which is very often adherent (Fig. 4). With the end of the index finger the parietal layer of the pleura is detached, the finger resting against the bony structure and not against the pleura, and by degrees working its way towards the apex of the lung. The detachment is continued in an upward direction anteriorly until the apex is entirely freed, then posteriorly, where it is decidedly difficult to free it owing to the depth. To reach the mediastinum, there are adhesions which are almost constant between the pleura and the vertebral column, and the neck of the ribs are additional difficulties to overcome. Whilst the operation is going on, the lung is seen to be collapsed at each inspiration, unless it is sclerosed or infiltrated with tuberculous masses. Many times in making the pleural detachment, we have felt underneath the detached pleural adhesions a sudden depression probably caused by a cavity. The inspiration and expiration of air in the cavity will soon cause an extrapleural pneumothorax which may lead to an infection; hence it is our custom when we detach the pleura to do so by the intervention of a layer of thin silk with which we cover the whole denuded surface so thoroughly that the air does not come in contact with the wound, and as a further precaution we sometimes coat the silk with a thin layer of vaseline (Fig. 5). The lung having been separated, there remains a large extrapleural cavity which it is necessary to fill. To accomplish this we are in the habit of using adipose tissue, fresh or preserved; sometimes we use Beck's bismuth paste or bismuth paraffine which is inserted in a cautious manner into the cavity, at the same time being careful to exclude the air, or prevent the inserted substance from coming in contact

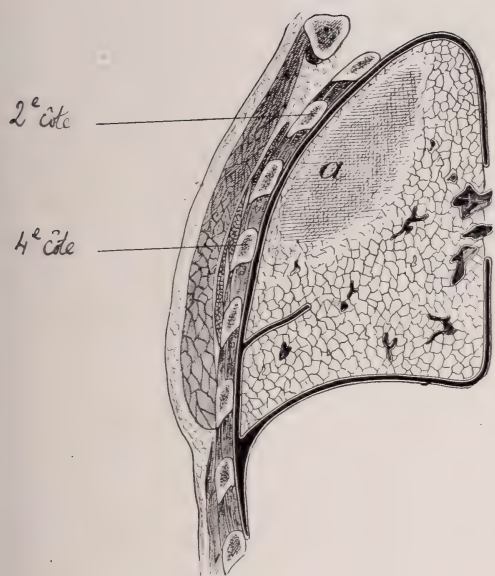


Fig. 1.—Diagram of extrapleural pneumothorax. Vertical incision of thorax. *a*. Zone of collapsed lung.

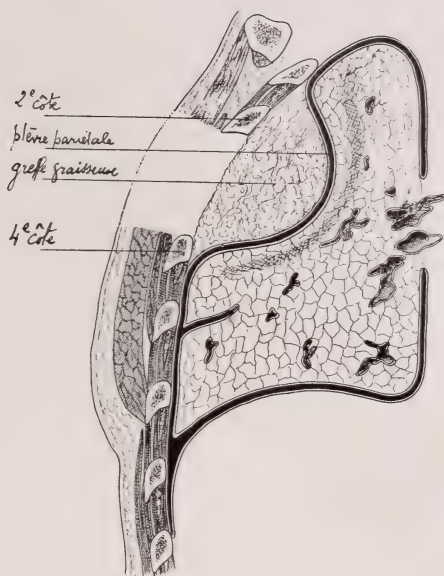


Fig. 2.—Diagram of extrapleural pneumothorax. Fatty grafts in position.

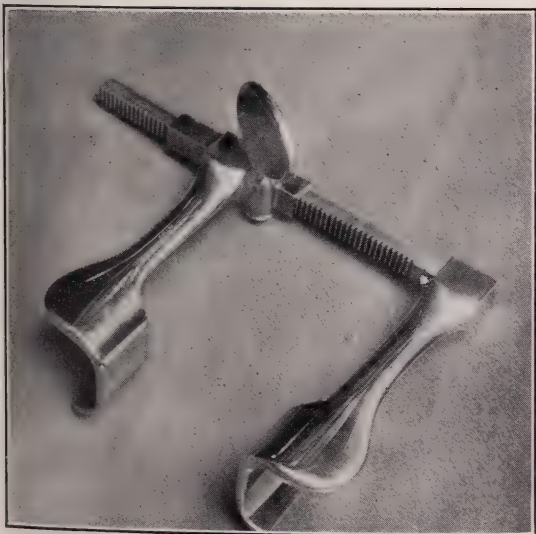


Fig. 3.—Tuffier's intercostal écarteur with toothed rack.

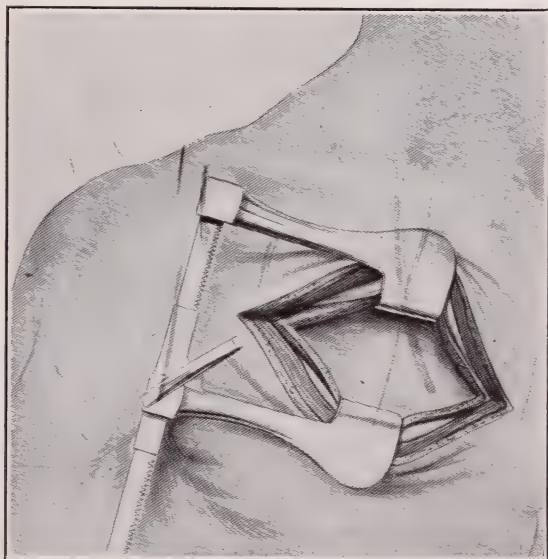


Fig. 4.—The parietal layer of the pleura at the back of the opening made by the forced diastasis of the second and third ribs.



Fig. 5.—Loosening of the pleura effected through the intermediary of China silk which protects the wound and the artificial extra-pleural cavity against outside germs.

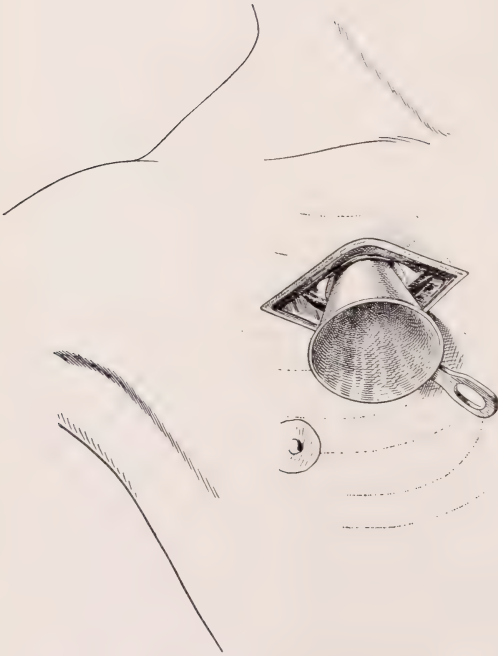


Fig. 6.—Funnel for filling the thoracic apex with Beck's bismuth paste or with bismuth paraffine.

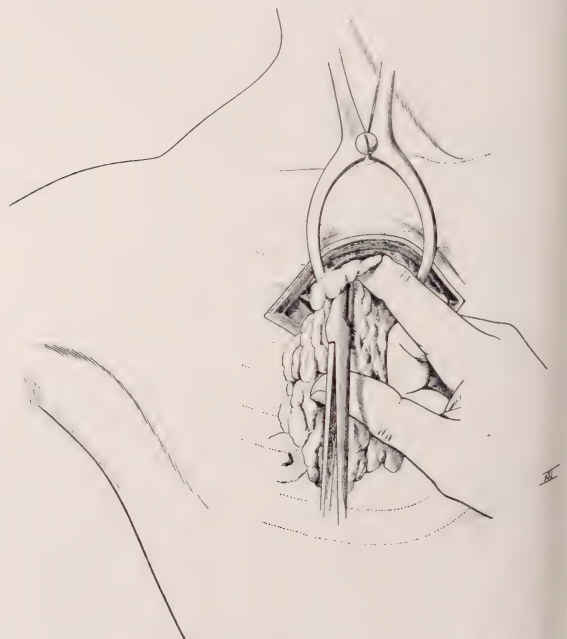


Fig. 7.—Introduction of fat into the artificial extrapleural cavity.

with the wound (Figs. 6 and 7). The foreign substance thus introduced fills the extrapleural cavity and compresses the region of the detached lung. It must be maintained in place and this is a difficulty that cannot be easily overcome.

Complete suturing either of the fibrous or muscular tissue is now made, or between the intercostal muscles and the periosteum, or an autoplasty is done. In one of our cases we filled the cavity, with pieces cut from an aseptic fibroma, in the manner in which a cork fits into a bottle, and in another case a piece of peritoneum was sutured on a level with the wound. The large and small pectoral muscles were sutured in two of our operations, and the union was effected without drainage.

The detachment of the lung from the ribs permits of the obliteration of the intrapulmonary septic cavity, by facilitating the retraction of the lung towards the hilus; the retraction is made permanent by plugging the region with adipose tissue or a substance such as we have described. Recently we saw a case, four months after the operation, in which the grafting had been done with adipose tissue; the fat was smooth and had retained its normal color, and was separated from the lung by the pleural interstice. Finally, the histological examination revealed the presence of healthy connective-tissue cells which showed that the graft had a good vitality.¹³

What is the value of this method in pulmonary tuberculosis? On March 6th, 1912, the operation was performed by us for the first time. The patient was from the city and had passed three winters at Davos. He had a large cavity on the right side and on the left an induration. After some months he died. His history was not recorded by his physician.

Since then we have operated fifteen times on the tuberculous; once when the disease was progressing on both sides. On the right side we grafted into the pleuroparietal space about 450 cubic centimetres of adipose tissue which had been kept five days on ice; on the left, bismuth paraffine in about the same quantity. The functional signs were ameliorated, the cough disappeared; there was neither dyspnea, hemoptysis, expectoration nor fever. Radioscopy showed on the left side the shadow of the bismuth paste; on the right, the light spot of adipose tissue.

Of the fifteen operated, three were treated with paraffine or Beck's bismuth paste; one with cavities in both apices succumbed. Of the other fourteen, four had secondary suppuration and the graft was eliminated in the abscess; in two cases the graft was closely adherent to the parietal pleura.

The other ten patients benefited by showing a lowered temperature, and a very decided lessening in the expectoration and the cough; in one case this change amounted to a complete suppression. But all these cures date only a few months back and the future

only can decide the value of this method. Recently Jessen¹⁴ reported 6 cases of pneumolysis the results of which have been generally satisfactory.

We draw no conclusions from the foregoing facts, but what we do wish to impress upon the reader is the simplicity of this surgical intervention even when bilateral, and how well it can replace in certain cases the pneumothorax operation which is of so disturbing a nature to the hematosis throughout the pulmonary parenchyma. As practised by us, the operation bears only on the diseased zone which it immobilizes, and, moreover, is of service in those cases where the pleura is adherent. As to the therapeutic value of artificial pneumothorax, one should not make any premature statements, since it is a fact that pulmonary tuberculosis has always repelled all medical and surgical efforts that have been attempted in the way of a cure. Nevertheless, it can be stated with surety that in the future the bacillary lesions in their incipency should be attacked. In the matter of a tuberculous joint we do not wait until suppuration or fistulæ have set in; and our results in these cases are always better the earlier we begin to treat them. A like early intervention in pulmonary tuberculosis, and the results, it can be stated here with certainty, would be gratifying. In short, the extirpation of the lesions in their incipency, or the immobilization of the diseased region, appears to us the two ways in which surgery ought to be utilized to be effective.

The initial fact which stands out prominently from the published results is that the very mutilating major operations in the tuberculous should be discountenanced and the more simple procedures studied. Another fact which forces itself upon us is the absolute necessity of post-operative medical treatment, carefully conducted and of long duration. After operation for a tubercular lesion, the patient, though still tuberculous, is much stronger; hence, therapeutic measures are more effective than they would be before the tuberculous foci were removed. To sum up, the close relationship between surgery and medicine should always be encouraged if we desire to achieve results that perhaps may be durable.

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PNEUMOTHORAX AND REST TREATMENT IN THE MANAGEMENT OF PULMONARY TUBERCULOSIS.

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AND

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Rest as a treatment for pulmonary tuberculosis is almost as old as the disease itself. It was early recognized that when a patient was kept absolutely quiet, the fever, cough, dyspnea and the other symptoms were greatly relieved. The amount of improvement was found to be in direct ratio to the degree of absolute mental and physical rest which the patient obtained.

The difficulty encountered in enforcing the strict 'rest cure' is accountable for the period of reaction which began about two decades ago and consisted of mental and physical activity. The patients were encouraged to take long walks, cross-country runs and various exercises in the open air, thus promoting the aeration of the blood in the pulmonary vessels and causing a reaction which was designed to throw off the toxins liberated from the diseased lung. This forced a patient, who, under rest, would have a respiratory exchange of 280 c. in. per minute, to have a respiratory exchange of 3,600 c. in.

This treatment was soon abandoned in the more advanced cases on account of the disastrous results, but it has been pursued advantageously up to the present time in a large percentage of the mild cases. Close clinical observation showed that the body when permitted to rest was better fitted to overcome the disease and immunize itself against the toxins formed by the destructive organisms.

Twenty-five years ago Dr. B. P. Anderson, of Colorado Springs, forcefully urged the practice of keeping the patients from exercises which would cause fatigue or an elevation of the afternoon temperature. Shortly after that Murphy made the statement that a patient with an acute tuberculosis of the lung should be treated on the same basis as a typhoid patient—namely, put in bed absolutely at rest and watched and dieted with utmost care.

This treatment gradually received more recognition, and to-day is exemplified most beautifully in the work done by Patterson, of London, at the Frimley Division of the Brompton Hospital for Tuberculosis. Patients coming to him with temperatures ranging from 101 to 105° F. are put to bed under the care of a nurse. They are not permitted to get up to eat, nor are they allowed to read or have visitors. This mental and physical rest results in a reduction

of the temperature to normal in from five to six days, unless there is a pus retention cavity somewhere in the patient's body. After the temperature has been normal for some time, the patient is gradually elevated in bed, and slowly increasing exercise is permitted each day. As soon as the afternoon temperature exceeds 99.6 to 99.8° F., the amount of exercise is decreased. Patterson's plan is not to have the temperature exceed 99.6 to 99.8° F. at any time. Thus by graduated exercises, the patients develop an *auto-opsonic index*, most favorable to repair. They walk about, begin to do light work, and finally men and women may be seen doing heavy manual outdoor labor without the slightest elevation of temperature as a result.

The principle of *organ rest* was first conceived by Carson, of Liverpool, in 1821, when he advanced the idea that a diseased lung would heal more quickly if the lung itself were put at rest. He published a paper in 1822, detailing experiments on animals in which he produced an immobilization of the lung by artificial, or rather, surgical pneumothorax. He made an incision between two ribs of a rabbit and allowed air to enter the pleural cavity. The animal lay for a few seconds as though stunned by a blow, and was then all right again. Five days later a similar opening was made in the opposite pleura of the same rabbit. The breathing became short, rapid and laborious, and the animal was restless and so weak that it could not stand on its legs. It looked as though the animal would die; however, in two hours it began to recover and in four hours was apparently normal. After five days there still remained some impediment in breathing. The animal was killed and the autopsy showed the diaphragm with a concavity toward the abdomen. The external incision had all healed. Two other similar experiments gave the same results.

Carson concluded from this that one lung may be reduced to a state of collapse with perfect impunity. He believed, furthermore, that pulmonary tuberculosis could be most successfully treated by "mechanical means, or in other words, by surgical operation." In support of this he referred to several instances of history where in battles soldiers received penetrating wounds of the chest wall and were cured of an existing tuberculosis.

Parolo (1849), Ramadge (1834), Constatt (1843), Wunderlich (1856), Ehler (1867), all spoke of Carson's proposed treatment founded on animal experiments and conclusions, based on clinical reports of the effect of accidental traumatic pneumothorax on tuberculosis; also that pleural effusions in those cases suffering from pulmonary tuberculosis had a decidedly favorable effect on the diseased lung, but there is no report to show that any of these men performed the operation on the human.

Forlanini, of Padua, was next to write on this subject. His article appeared in an Italian medical journal in 1882.

The paper, "Surgery of the Lung," read by Murphy at the meeting of the American Medical Association, June 7th, 1898, and the

subsequent work by Murphy and Lempke influenced Professor Brauer, then of Breslau, now of Hamburg, to take up actively the treatment of pulmonary tuberculosis by the production of a pneumothorax. Forlanini and other European physicians began using the method extensively and have continued it up to the present time. The great interest in this work may be best judged from the fact that 384 articles on pneumothorax as a treatment of tuberculosis of the lungs have been gathered from the medical literature of Europe alone.

A number of Americans have also been carrying on this treatment on the same plan and with the same results as Murphy and Lempke first reported.

INDICATIONS AND CONTRAINDICATIONS.

Authorities, both in this country and in Europe, differ concerning the indications for giving the pneumothorax treatment. Sternberg,¹ drawing conclusions from 43 cases, divided the indications into two groups, first, the advanced unilateral cases, and second, the cases with small but rapidly advancing lesions with brisk and frequent hemorrhages. He considers advanced bilateral tuberculosis and incipient cases not suitable for the procedure.

King and Mills² have treated cases which have failed to improve under the usual and more conservative measures. Their report is of value because they have treated only the hopeless cases. A small percentage showed permanent relief and one-fourth of their patients showed improvement.

Balboni³ says "treatment by artificial pneumothorax ought only to be resorted to after having given a fair trial to other well-known forms of treatment. If then the patient's condition does not improve or becomes worse, pneumothorax is to be undertaken at once." He gives as the contraindications extensive or complete union of the leaves of the pleura; the acute bilateral forms of phthisis; grave cardiac or renal lesions and empyema.

Lapham⁴ says "if all else has failed, if symptomatic and tuberculin treatment cannot arrest the process, then the attempt to save the patient by compressing the lung would seem amply justified."

Billon⁵ says that the age of the patient is an important consideration. He has found that past the age of thirty-five or forty at the most, pneumothorax is not well borne. In the child the injections only lead to slight dyspnea, which soon disappears. The most suitable age is between fifteen and thirty.

Lenormant⁶ says that the American surgeons have advised employment of artificial pneumothorax in the beginning of the disease. Recent European authors, however, reserve this method for chronic unilateral lesions with cavity formations, in which cases the efforts were unsuccessful in a number of instances on account of pleural adhesions. These failures are rare in American statistics (Murphy 4 in 36; Lempke, 5 per cent.) on account of the fact that they deal with the cases in an early stage. According to For-

lanini rapid development of the disease is also a contraindication, but here again Brauer and von Muralt have had excellent results in just such acute cases.

In a recent article, Gray,⁷ of Chicago, reports 61 cases treated in the various stages. He prefers the incipient cases, and cites Brauer and Spengler's series of 88 cases treated in the late stages with 23 deaths and 8 failures, and very correctly makes the queries, Is it well to wait until the outlook is so desolate? Is lung collapse such a desperate operation as to be used only as a last resort?

Saugman⁸ reports 35 cases of the early and non-complicated type, of which 12 were well after terms ranging from sixteen months to three and a half years. Five were apparently well after terms of fifteen months; 10 were still under treatment under seven months to two years, and 8 died. In a more recent report of 32 cases, Saugman has 5 patients who are well, 13 who have no symptoms, 10 improved, and only 4 dead.

A number of authors state that the compression treatment is contraindicated in cases of advanced bilateral tuberculosis. Lempke, in his citation of nearly 100 cases in Dr. Murphy's service, reports good results in just this type. The side most affected was treated first; later the opposite pleura was injected. He found, as have others, that the lung not compressed, though involved, showed improvement by reason of the compression of the opposite lung.

The explanation of this was given by Scheppelmann⁹ who believed that in unilateral pneumothorax the presence of the gas puts the mediastinum at rest and does away with the injurious mediastinal fluttering, so that the more normal lung can breathe more quietly and freely.

Pulmonary fibrosis resulting from continued compression has been mentioned as a deleterious after-effect of the pneumothorax treatment. Breun and Sauerbruch produced pulmonary fibrosis in a dog by ligating the pulmonary artery. The same procedure in the human caused a shriveling of the lung, supporting in a manner Stokes' contention that pneumothorax obliterates the vessels and hence causes atrophy and fibrosis. We know, however, that the compressed lung, when relieved of pressure, expands and resumes its normal functions and size. Clinically, it has been noted that when two sides are injected separately in a bilateral case, the non-compressed lung functionates again.

We believe that the fibrotic areas that have been found in the lung, as shown by Forlanini, undoubtedly represent the former tubercular lesions. The more advanced the disease, the more fibrosis, supporting our original contention for early treatment. In not a single case of our whole number did the lung fail to resume its function, and upon examination of many of our cases treated ten to fifteen years ago, not the slightest evidence of the compression was demonstrable.

Murphy originally advised the treatment in the earliest stages of the disease as well as in the advanced ones; and after having seen 500 cases treated in his service, he still advocates that the time for

giving the pneumothorax treatment is exactly the same as for treating tuberculosis in any other part of the body, which means, that it should be given in the earliest stages of the lesion. When the patient comes for treatment, often with an initial hemorrhage and often with the initial cough, treat him exactly the same as you would a tuberculosis of the spine or of any other joint,—put the part at rest. It is exactly the appendix proposition over again—namely, that the physician and surgeon are waiting for the disease to ‘ripen,’ to have it rich and juicy before instituting sufficient measures for its cure. Years ago in medicine this procrastination was considered an evidence of genius and conservatism. It is really a stigma of ignorance, timidity and incompetency.

To accentuate the value of early treatment the following case is cited.

On December 21st, 1900, a female, *æ.t.* twenty, came to Dr. Murphy’s office on account of a slight cough which had persisted for three months. She had a slight expectoration which several times in the morning had been streaked with blood. There was some pain under the right scapula and beneath the sternum, and the patient had lost 15 lb. in weight. The temperature on examination was 99° F. Tubercle bacilli were found in the sputum. The patient received three injections of nitrogen gas into the right pleural cavity. The temperature subsided, the expectorations ceased, and the patient recovered. On February 2nd, 1914, this patient was again seen in the office. The lungs were found in perfect condition and no evidence of tuberculosis was anywhere demonstrable. This is only one of the many cases treated in the early stage in which permanent cures were rapidly effected.

The cases in which Murphy believes this method to be most practical are those in the early stage of apical and monolobar tuberculosis, as there the pathological conditions are such that the compression of the lung can be easily accomplished and adhesions are not likely to be found. He does not consider that it is indicated or practical in far-advanced or chronic tuberculosis, where the fibrous tissue deposited in the lung will not permit of its compression (Figs. 1 and 2).

Theoretically the dangers of compression may be:—

- (a) Hemorrhage from wounding the intercostal vessels.
- (b) Injection of gas into the intercostal vein.
- (c) Infection by the use of impure gas, infected trocar or improper antiseptic preparation of the chest wall.
- (d) Rupture of infected foci into the pleural cavity through compression of the lung and separation of pleuritic adhesions.
- (e) Dyspnea from the use of too large a quantity of gas; this can be readily relieved by changing the direction of the current and permitting some of the gas to escape from the pleura.
- (f) Puncture of the lung with the needle.
- (g) Pleural reflexes resulting in collapse, spasm of the larynx, etc.

While these possibilities of danger are mentioned, no accident has ever occurred, excepting in one of our cases reported by Lempke. This patient had an air embolism resulting in a hemiplegia.

The quantity of gas should always be large, that is, as much as the patient will tolerate without great dyspnea, and it must be borne in mind that this quantity can be injected without a great plus pressure. We do not agree with Schwatt who suggests the injection of an ounce or an ounce and a half as an initial dose. That would remind one of amputating the leg by cutting off the toes first and then taking off piece after piece until you reach the hip. If compression is indicated at all, real compression is indicated, and 60, 150 or 200 c. in. may be injected at a sitting if properly administered. It is noted in reading over the literature that many men inject their patients at periods ranging from six weeks to six months. Our experience shows conclusively that a considerable absorption takes place in three to four weeks and that three to six weeks is the length of time that should elapse between injections. In order to get the best effect, the lung must be kept completely immobilized.

Balboni says that though authorities differ as to the duration of the compression, all agree that it must be kept up for a long period. Conditions vary so much that it is impossible to give a definite length of time which will include all cases; but when we consider the gravity of the tuberculous lesions in advanced cases of phthisis and the persistent formation of cavities, it is apparent that the compression must be maintained for months or years.

Forlanini says that the pneumothorax must be continued indefinitely in the following cases: First, in case of advanced phthisis in which there are extensive or disseminated foci; secondly, in cases in which the other lung has lesions or is threatened.

What influence does the placing at rest of one lung exercise on the other lung? Forlanini has shown that a properly proportioned pneumothorax of one side does not injure the non-compressed lung. If the non-compressed lung is healthy, it is capable of carrying on alone the respiratory functions of the organism and doing the work of both lungs. If the non-compressed lung is diseased and the lesions are not so extensive as to allow compensatory respiration for the compressed lung, Forlanini claims that its lesions may heal or be arrested through a mechanism not easily explained, but which is exactly opposite to that by which a cure is effected in the compressed lung, that is, by increased respiration and increased blood and lymphatic circulation. From these things a better nutrition results which protects those portions of lung not yet affected. The site and nature of the lesion in the non-compressed lung is of more importance than its extent. Apical lesions are not as dangerous as lesions situated centrally; an arrested process may carry on the respiratory functions without giving rise to untoward symptoms. The ingenuity of the physician will be taxed to the utmost in dealing with the bilateral case presenting an extensive active process

of one lung and an active process in the other, especially if the lesions are centrally located and the patient is septic. The lesions may be aggravated by the increased functions or by the amount of the toxins liberated, so that the treatment may have to be discontinued for a time, or conducted very cautiously.

The duration of the compression from a single injection, we believe, depends upon the rapidity of gas absorption and the kind of gas used. Unverich demonstrated in 1896, by means of chemical analysis of the air injected into the pleural cavities of dogs, that the different gases are absorbed with varying degrees of rapidity. Oxygen disappeared first, then carbon dioxide, and at last the nitrogen. In connection with our first case injected with nitrogen, which was performed in 1895, and reported in Denver in 1898, it was demonstrated by repeated physical examination and by radiography that the lung remained collapsed a little over two months. In other cases reported at that time, the absorption of the gas took place more rapidly; and it was Lempke's subsequent experience that in the majority of cases the absorption at the end of three and a half to four weeks had progressed sufficiently to make the breath sounds audible.

Nitrogen with gomenol has been injected by Billon.¹⁰ We believe that gomenol or some other antiseptic should be used more in connection with effusions in the pleural cavity than as a compression treatment with nitrogen; however, Billon's results in these cases are sufficiently striking to call one's attention to them in the management of the pleuritic effusions.

ACCIDENTS.

A number of operative accidents during and after the introduction of nitrogen gas have been reported in the literature.

Sundberg¹¹ reports 3 deaths: First, a woman of twenty-eight was about to receive the eighth injection of air. As a trocar was being inserted into the intercostal space, she was seized with syncope and died with hemiplegic symptoms thirty-six hours later, without regaining consciousness. Necropsy showed numerous foci of softening in the cerebral cortex and thrombosis of the small vessels. Sundberg believes that these were due to vascular crises in the cerebrum, originating in the pleural reflex.

Second, a man of forty-nine had just received 300 c.cm. of gas when he became sick with intense and progressive dyspnea. To calm him, 15 mgrm. morphine was given hypodermically, but death ensued in twenty-five minutes. Necropsy showed that the vocal cords were not in the cadaveric position, but tightly opposed by their inner margins. The author thinks this patient succumbed to a spasm of the glottis.

Third, a man of twenty-one died after the nitrogen was injected for the sixth time. Necropsy showed no cause for his sudden death, and Sundberg believes that while the pleural reflex may have been

responsible for the first two fatalities, the cause of the last is problematic.

Balboni says: "Massive injections or rapid introductions of gas will cause dyspnea and collapse due to displacement of the mediastinum from pressure on the other lung and heart. Pressure symptoms need only be slight at the time of introduction to become marked in a few hours." We have had no such experience.

The rapid evacuation of the contents of the tuberculous cavities may cause the spreading of infection into the other lung (Forlanini, Schmidt, Brauer).

In the course of treatment a pleural effusion may make its appearance, usually after the pneumothorax is well established. Dumarest thinks it is due to a secondary infection following trauma to the lung. Schmidt assigns every pleural infection to the technique, and adds that he has never observed a pleural effusion in any of his cases. Persh calls attention to the fact that the infection may be carried in by the needle from a minute particle of cuticle, as it may be impossible thoroughly to sterilize the operative field. Forlanini lays stress on the microbic origin, *i. e.*, pathogenic germs passing from lung to pleura. Gretz thinks the slowing of the lymphatic circulation is an important factor. Braun, in 40 cases treated, has not had a pleural effusion. He attributes this to the great care taken in thoroughly sterilizing the instruments, nitrogen and operative field.

During 1907-8, Forlanini¹² made 1,454 injections of nitrogen into the pleura. In 4 only were there any accidents and in but one of these did death follow. This was a case of miliary pulmonary tuberculosis with a pericardial effusion of about 200 c.cm. Since then he has made thousands of injections with no further ill effects.

Jensen¹³ reports an experience which confirms Brauer's statement that embolism may occur from air getting into a pulmonary vein without coming directly from the exterior. It is immaterial whether the embolism is caused by oxygen, nitrogen or air, and it is probable that certain cases published as pleural 'epilepsy' were in fact cases of embolism.

Bard¹⁴ presents evidence to prove that pleural pulmonary fistulæ are of much more frequent occurrence in the thorax than has generally been recognized. We do not believe this to be a contraindication to the treatment as long as the patient recovers from the tuberculosis.

From his experience, Murphy believes that the fatal results are due to failures in the technique and to an absence of the knowledge of the accidents that can occur in the surgery of the lungs, independently of the pneumothorax treatment. He suggests that the men who expect to follow this line of work should do experiments on animals. This experimental work in the chest and with the lung will give a knowledge which will be of inestimable value in the therapeutic work.

Death from dyspnea should not occur. If the attending surgeon

is on the alert, all he needs to do to avoid a fatality in these cases is to introduce a trocar or a large aspirating needle into the pleura on the side on which the pneumothorax exists and permit the air to escape and thus reduce the plus pressure which is displacing the mediastinum. If he has neither trocar nor exploratory needle, he can freeze the skin with a little salt and ice, cut it, then with a hemostat spread the tissues, rupture the pleura, open it and permit the air to escape and thus save the patient. We had but a single instance of rupture of the lung or bronchus into the pleura in our total number of cases. The reason for the absence of this accident is due to the fact that our apparatus has scarcely a plus pressure, as it carries only $\frac{3}{4}$ oz. to a square inch. Pressure to force the air in is absolutely unjustifiable. If the lung is organically adherent, it should not and cannot be efficiently torn away, and therefore great plus pressure would have no advantage, and if the pleura is not organically adherent, it needs just a plus pressure for the admission of the air.

PATHOLOGICAL CHANGES.

It is interesting to note the pathological changes that take place after the compression of the lung. Balboni cites observations of a few such cases that have come to autopsy, the patients dying of intercurrent diseases. He gives anatomical proofs of recovery through cicatrization of all the destructive lesions of the lung which had been treated with artificial pneumothorax. Forlanini, in the microscopic study of 3 cases, noticed that the compressed lung undergoes great modifications. First, he noticed atelectasis; second, an extraordinary tendency to the formation of hard masses about the bronchi, and large vessels in the pneumonic foci; and third, the formation of a capsule about the old tuberculous lesions and a tendency to cicatrization. Graetz, Brasche and Wurtzen have since confirmed these findings.

It can be readily understood that the anatomic healing of the lesions comes about slowly, which is typical of repair of tuberculous lesions in all tissues of the body, except the peritoneum. It is the work of months or even years; it may never come about or it may be partial. There takes place in the lung what is noticed in the articulations and in the bones in cases of tuberculous osteitis and arthritis. After a long time the tuberculous tissue is fixed, organized and absorbed. At this point the cavity walls are reduced to a state of a granulating wound; they coalesce, cicatrize, and then the healing process becomes definite. But before granulation and cicatrization and the formation of connective-tissue about the tubercle take place, a long time elapses, and during all this time the pneumothorax must be maintained, always at the proper volume and tension, and this means not several weeks but many months.

Lenormant reported two necropsies of Forlanini and three of Graetz. In the first 2 cases, the patients having succumbed to in-

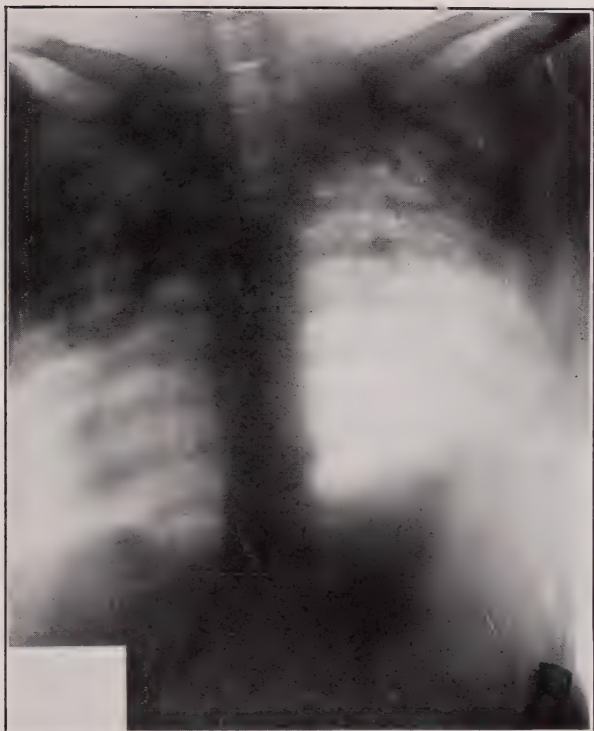


Fig. 1.—Case of pulmonary tuberculosis of twenty years' duration in which, because of the extensive adhesions between the parietal and visceral layers of the pleura, it was impossible to inject any nitrogen. The mottled appearance of the lung shows very well, especially in the apices.



Fig. 2.—Case of pulmonary tuberculosis of about ten years' duration with extensive intrapleural adhesions and a large cavity in the left apex and fibrotic changes throughout both lungs.

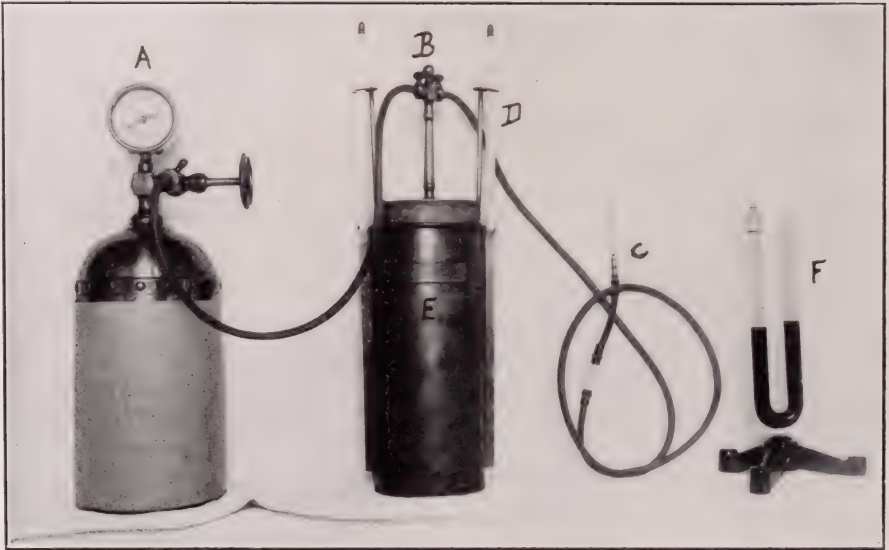


Fig. 3.—Nitrogen gas injection apparatus. *A* is the tank containing the nitrogen gas. It is surmounted by a gauge indicating the tank pressure, and connects by a rubber tube with *B*, the cylinder into which the gas flows from the tank *A*. This cylinder has no bottom and rests on water in the tank *E*. The graduated upright *D* indicates the number of cubic inches of nitrogen gas in cylinder *B*. The rubber tube *C* connects at one end with cylinder *B*, and at the other end is attached the needle which is pushed into the pleural cavity to make the injection. *F* is a U-shaped glass manometer on a metal base which is used by some to indicate negative and positive pressure. It is interposed anywhere in the course of the rubber tube *C*, but need be used only if desired.

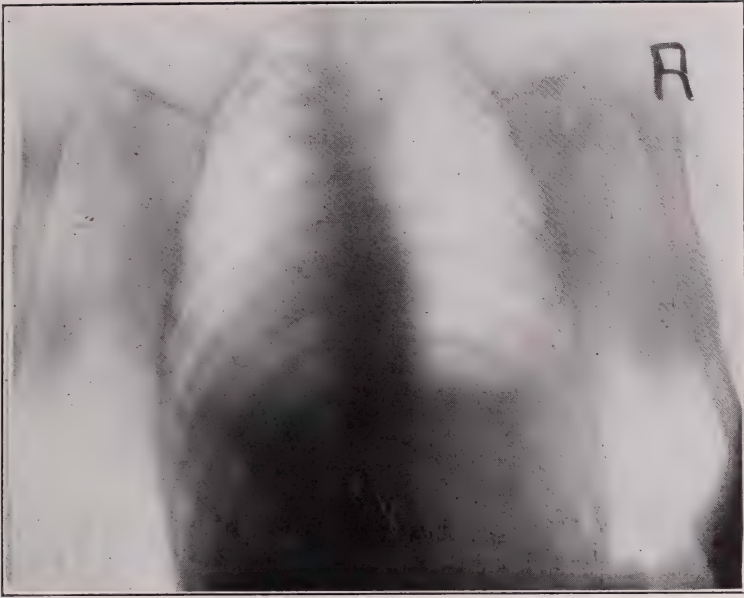


Fig. 4.—Tuberculosis of the left apex definitely located by physical examination but not shown well in this skiagram. There are no fibrotic areas and nothing to indicate intrapleural adhesions. This skiagram was made before the nitrogen injection.

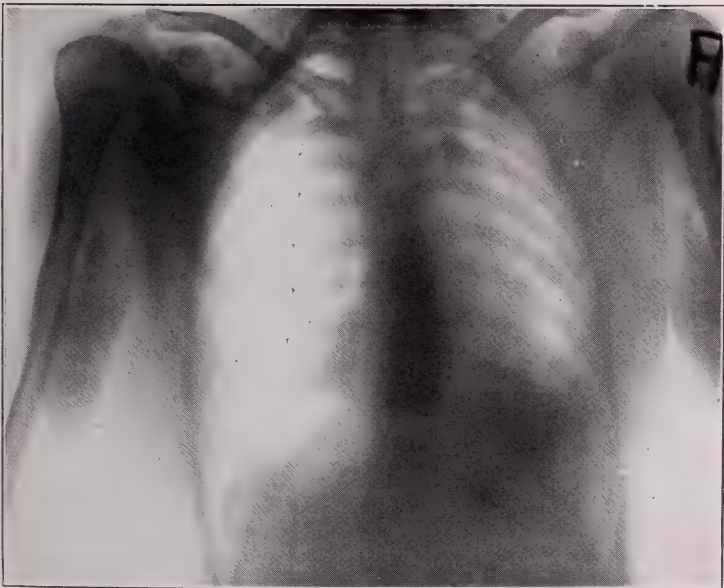


Fig. 5.—Tuberculosis of left apex made after the nitrogen injection. The lung is compressed as shown by the arrows. Compare with Fig. 4.

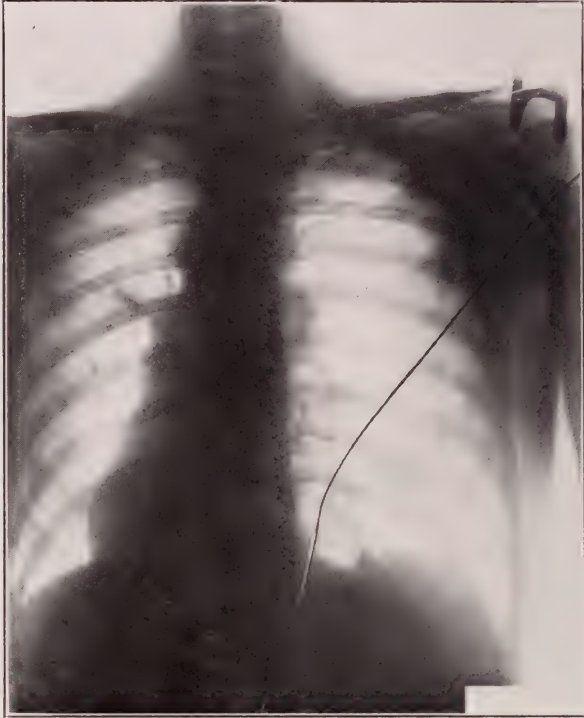


Fig. 6.—Tuberculosis of right lung before nitrogen injection. There is no evidence of intrapleural adhesions. (This plate was broken, hence the black line through the right lung.)



Fig. 7.—Tuberculosis of right lung after compression. The lung is compressed against the spine, as indicated by the arrows. This patient has had three injections. This skiagram was made after the first.

tercurrent affections, it was found that, with the persistence of the pneumothorax, there had been anatomic cure of the pulmonary lesions, and the transformation of the collapsed lung into a fibrous mass, with no trace of tuberculosis.

MURPHY'S TECHNIQUE.

In classifying Murphy's technique, a Boston writer, who evidently does not read American medical literature, gave the plan as the incision administration of gas. Murphy has never advocated nor even thought of administering the gas through an incision. The technique is briefly as follows:—

The patient is placed in a comfortable sitting position and the chest is bared over the side to be injected. The point of insertion of the needle varies somewhat in individual cases. If the apex of the lung be the site of the lesion, the needle should be inserted in the fifth or sixth interspace between the anterior and midaxillary line. The *best point* is the fifth interspace at or near the anterior axillary line. If it be a middle or lower lobe tuberculosis, the injection should be made over the upper lobe, preferably in the fourth interspace just outside the mammary line. Ethyl chloride may be used for local anesthesia, though we have recently infiltrated the injection zone with a novocain solution and have found it most satisfactory, for in this way the skin and tissues down to the pleura may be thoroughly anesthetized. A tenotome puncture should always be made through the skin to permit of easy insertion to the needle, and to prevent the introduction of septic fragments into the pleura. It is important after the needle is inserted and before the tube is attached to assure oneself that the point of the needle is in the pleural cavity, and this is done by instructing the patient to take a series of deep inspirations. If the needle is within the pleural cavity, a current of air may be heard to rush in. After several deep inspirations, if a little air has entered the pleural cavity, there will be a current during both phases of respiration. The opening of the needle should be covered with cotton for the purpose of filtering the air that is admitted and thus diminish the likelihood of infection of the pleura. Sometimes even though the point of the needle be within the pleural cavity, it is found that the current of gas meets with considerable resistance. This is undoubtedly due to the fact that the current of gas, unless some pressure be used, impinges on a small area of lung tissue, and that it is not sufficient to overcome the cohesion that exists between the two layers of the pleura, which cohesion Lempke said had been estimated at $12\frac{1}{2}$ mm. Hg. To determine that the tip of the needle is in the pleural cavity, a manometer may be used after the manner of Gray, which will indicate negative pressure by a sudden rise in the near column of the instrument, provided that there is no adhesion between the leaves of the pleura, at the point of puncture.

We always use a blunt needle, aspirating size, with an additional

opening on the side of the needle near its tip. This opening permits the gas to pass into the pleural cavity should the tip of the needle be plugged by a bit of tissue. After the needle has been introduced, it is attached to the tubing leading to the cylinder which contains the nitrogen gas (Fig. 3). The quantity of gas to be injected varies considerably and should range from 50 to 200 c. in., the amount to be given in each case being best regulated by the symptoms of distress, dyspnea, and the displacement of the mediastinal contents and diaphragm. When the proper amount of gas has been injected, the needle is withdrawn, the wound sealed with collodion, and a small firm compress is placed over the puncture. This compress prevents the escape of gas from the pleura into the subcutaneous cellular tissue. The patient is then placed in bed in a comfortable position. If the cough or dyspnea become annoying, a small hypodermic of heroin may be given.

Skigrams should be made before and after the injections to determine the progress of the disease, to watch the extent of the lung collapse, and to note the pressure on the heart and mediastinum.

RESULTS.

Faginoli¹⁵ claims to have given about 2,000 injections with some excellent results. Lenormant published the following table in 1909.

	Cases	Adhesions too numerous	Treatment interrupted	Cured	Improved	Failed	Acute process in other lung	Deaths
Forlanini.....	8			5	2		1 (D)	
Brauer-Piggar.....	6	2			3		1 (D)	
Brauer (Unpub.).....	26	1			22	3		
Schmidt.....	13	2	4		2	4	1 (D)	
Lexer-Schreiber.....	5	1			2		2	
Saugman.....	13				12		1	
von Muralt.....	6	2		1	3			
Fontana.....	9				8			1
Orlandi-Antonini.....	2			2				
	88	8	4	8	54	7	6 (3D)	1

Spengler¹⁶ in 1911 reported 15 cases as cured. The pneumothorax had disappeared; 1 for fifteen months, 7 for thirty months, and 1 for forty-eight months. There was a disappearance of fever and cough. A few of his patients expectorated, but the sputum no longer contained bacilli.

Thousands of cases could be collected from the literature showing a complete symptomatic cure in many and a vast improvement in a great majority of the patients. From an experience of nearly 500 cases treated by Murphy and his associates, with an aggregate of 2,500 injections, we conclude that the artificial pneumothorax should always be made in every case of pulmonary tuberculosis where there is no absolute contraindication.

In reviewing the results obtained in our own cases and the results collected from the literature, we may sum up the following advantages of pulmonary rest:—

1. The decline or disappearance of the fever, showing a diminution or inhibition of absorption from the mixed as well as the tuberculous infection.
2. The diminution or disappearance of the expectoration.
3. The disappearance, partial or complete, of the bacilli in the sputum.
4. The gradual increase in weight.
5. The lessened frequency of hemorrhage.
6. The great general improvement of the patient and the short time in which these changes take place.

We are convinced that when the profession as a whole adopts our original plan of early treatment, the percentage of cures will be increased greatly over what it is now; that the period of convalescence and incapacity will be reduced to a minimum; that the accidents in the administration will be negligible in number. Furthermore, we believe, that the diagnosis in the future should be made in the *pre-cough* or *pre-sputum* stage of the disease in place of having it made in the cavernous, *excessive expectoration* and *protracted cough stages* of the disease; that pulmonary rest is the initial indication in the initial stage of pulmonary tuberculosis and can be safest and best secured in the incipient stages.

We take a pardonable pride, we hope, in seeing this method universally adopted, sixteen years after it was first advanced by us, as an effective treatment for pulmonary tuberculosis.

This work is now being carried on in Murphy's clinic by Kreuscher with very gratifying results in a large percentage of cases.

The following case histories are illustrative of the type of cases in which the nitrogen gas is being used and the results that are being obtained.

CASE I.—Patient, female, *æt.* thirty-six, who came for treatment in 1903 on account of a persistent cough and some expectoration; slight afternoon temperature ranging from 99 to 100° F. Under medical treatment the patient improved and was fairly well until December, 1912, when she returned on account of the cough which had persisted for several months. The history of her present trouble was as follows: On October 1st, 1912, the patient had a cold following which there developed a persistent cough, and considerable expectoration consisting of a yellow material, and on several occasions there was blood in the morning expectoration; no tubercle bacilli were found. There was slight loss in weight and the patient's appetite had been poor for several months. Examination of the chest showed râles in the left apex. A tuberculin test gave a reaction of 102° F. twenty-four hours later. Therapeutic injections of tuberculin were given once each week for four months, and the cod-liver oil emulsion was given three times a day in large doses. The patient at this time refused the compression treatment.

A reexamination on October 16th, 1913, showed evidences of a pulmonary focus in the apex of the lung. The temperature ranged from 99 to 100° F. each afternoon; sputum was streaked with blood and contained tubercle bacilli. In spite of forced feeding and rest, she had lost in weight. The patient was sent to the hospital on October 19th and the nitrogen gas was in-

jected into the pleural cavity. Fig. 4 is a skiagram of this patient's chest before injection. Fig. 5 shows the compression of lung after injection.

This patient since then has had three injections, and at the last examination, February 10th, 1914, showed a marked improvement of the pulmonary condition; the cough had almost entirely disappeared, the sputum showed no tubercle bacilli, and the patient had gained in weight.

CASE II.—Patient, female, *æ*t. thirty-eight, was sent to the hospital on account of a persistent cough and some expectoration. She gave a history of having had a pneumonia eleven years ago from which she did not convalesce rapidly. Eight years ago she had consulted a 'lung specialist' who said that the apex of her right lung was involved. She was advised to live in a high altitude, but the cough improved and the patient remained in Chicago. In January, 1913, the patient again consulted a physician who found the pulmonary condition worse than it had been at the previous examination. One year's residence in Colorado did not materially improve her cough and her general condition. In December, 1913, the patient came to Mercy Hospital for the nitrogen gas injection. Examination of the chest revealed râles over the right apex and an area of dullness about the size of a silver dollar below the middle of the clavicle. The temperature when taken at 4 p. m. was 99.8° F. Tubercle bacilli were found in the sputum. Fig. 6 shows the chest before injection and Fig. 7 the compression of the lung after the introduction of 200 c. in. of nitrogen gas into the right pleural cavity.

This patient has had nitrogen gas injections every three weeks, and when last examined on February 20th, 1914, had little or no expectoration; tubercle bacilli were not found in the scanty, grayish-white sputum which patient expectorated only in the morning. The temperature was 98.6° F. at 3 p. m., and the patient had gained in weight.

The injections will be repeated until all signs and symptoms have disappeared. Tuberculin will be given in small gradually increasing doses until the patient is fully immunized against the tuberculosis. We have all reasons to believe that this patient will get absolutely and entirely well.

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THE TREATMENT OF 'SURGICAL' TUBERCULOSIS AT THE SANATORIA ON THE FRENCH COAST AND IN THE SWISS ALPS BY HELIOTHERAPY.

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"The Human Flower is, of all Flowers, that which most needs the Sun."
—Michelet.

Marine Hospitals for Tuberculous Children.—Up to within the last five or six years the prevailing opinion seemed to be that tuberculous children, especially those affected with so-called 'surgical' or external tuberculosis, were best treated at the seashore. This opinion is doubtless traceable to the remarkably good results obtained at the great French sanatoria and, even earlier, across the Channel at Margate in England. There never has been a more extensive use of sea air for this class of patients than that afforded by the institutions at Berck-sur-Mer, or Berck Plage, as it is now called, some twenty-five miles south of Boulogne on the English Channel. Italy began to establish marine hospitals for cases of surgical tuberculosis fifty years ago. Ten of these are situated on the Mediterranean and ten on the Adriatic sea. The new marine hospitals at Rimini, one supported by the province of Bologna, and the sanatorium Comasco adjacent to it, are excellent examples of hospital construction but are not particularly adapted for heliotherapy. The former includes thirteen separate buildings for boys and girls not all of whom, however, are tuberculous. The other marine hospitals on the upper Adriatic, at Fano, and further up at Lido, near Venice, report a large per cent. of cures in all classes of surgical tuberculosis.*

Perrochaud, encouraged by the success experienced as early as 1845, when some scrofulous children were sent to St. Malo, on the coast near Dinard, and to the hospital at Forges-les Bains, near Paris, where the mineral waters were applied, others being sent to Montreuil-sur-Mer, in 1858 started a small hospital on the seacoast near the site of the present magnificent sanatorium. It is recorded that of 37 patients, treated in 1859, 25 returned home cured. The next year the number was doubled and a similar good result followed. With an experience of fifty years the great Mari-

*Guiseppe Badaloni: *La Cura Marina nella Scrofolà*. Turin, 1889; *La Scrofolà ed il Mare*. Milan, 1889.

time Hospital with its 1,100 beds supported by the Administration Générale Publique of Paris carries on the work with even greater efficiency.

A description of the remarkable hospital at Berck Plage should prove interesting. Only recently have the new buildings been opened. They are on a magnificent scale costing well over a million francs a year to maintain, and are supplemented by several other institutions devoted to the same class of patients. One of these is at Hendaye on the coast near the Spanish border and not far from Biarritz; the other is at Forges-les Bains, near Paris. At Forges four-fifths of the cases are of the 'medical' type, while at the Maritime Hospital at Berck and Hendaye four-fifths are of the 'surgical' type. Three hundred beds at Berck Plage are devoted to patients confined to bed. Besides the three hospitals just mentioned there are two others, the sanatoria Bouville and Vincent, providing for a similar class of patients. These latter institutions, originally private, have been taken over by the Government and have been for forty-five years doing a most creditable work. At the Maison Bouville there are 378 beds and at the Maison Vincent there are 236 beds.

Following the pioneer work of Perrochaud and Cazin at Berck, the later development largely owes its efficiency to V. A. Menard, whose service has extended over twenty-two years and, as Surgeon-in-Chief, directs all the medical and surgical work at the Marine Hospital. He has contributed many valuable monographs on coxalgia and Pott's disease and reports annually his vast experience.

It is interesting to note that as far back as 1857 Mme. Duhamel, who cared for scrofulous children at Berck, had them wheeled twice a day to the beach, and after bathing them and washing their open sores, refused to clothe the children completely, evidently with the idea that the unobstructed sun and air should be allowed to hasten their cure. Now at Berck, as at the Alpine sanatoria, the free access of sunlight is esteemed the essential feature of treatment. The long galleries, or balconies, at the Marine Hospital are constructed with the express purpose of carrying out the open-air method with *complete exposure of the body to the sunlight*.

In the new pavilions at Berck the patients confined to bed are wheeled from the sleeping wards out on the adjoining galleries at all seasons, except in bad weather or violent wind, where they spend the entire day. In summer the hours on the gallery are from 6 a. m. to 5 or 6 p. m. At night the windows of the wards are always open to the west, the side of the sea, or on the opposite side when stormy. The children remain unclothed from morning until evening but at night have a slight cover.

Operative wounds are exposed after the fifteenth day, but operations are exceptional and performed only as a last resort. Ab-

scesses are never opened but aspirated, followed or not by injections of suitable medication. Orthopedic treatment is accomplished by prolonged immobilization in plaster. All patients not bedridden are given exercise on the beach, and sea baths are used in warm weather. The beach itself is wide and sandy and very favorable for children.

There is also a large swimming pool situated in the centre of the buildings into which sea water is pumped and heated by steam coils to a suitable temperature for bathing at all seasons. Fresh and salt water is also available in the bathtubs throughout the establishment. There is also a hydrotherapeutic department with hot air and steam cabinets.

Alpine Sanatoria for External Tuberculosis.—Turning now to the Alpine sanatoria we find this open-air method carried out with remarkable success. Indeed it was doubtless the encouraging results obtained by Rollier, of Leysin, that the open-air method was put into complete operation at Berck Plage. Both French surgeons and the Swiss surgeon Bernhard, of Samaden, had previously exposed the affected parts to the sun; but Rollier went further and exposed the whole body, except where some light, removable plaster apparatus is used. Even here large fenestra are left so that the sunlight may have free access to the diseased part which is in greatest need of it. Plaster tends to check the function of the skin and favors anemia, softening and lowering of the nutrition of all the subjacent tissues and restricts healthy tissue changes. Moreover, serious atrophy of muscles and ligaments results from the permanent plaster apparatus commonly employed. Rollier comments on the bad appearance and sometimes the edema of the limbs of patients arriving with these immovable plaster dressings.

Rollier has succeeded in training his patients, both children and adults, by systematic and strict methods adapted always to the individual case so that they live in the free air of the Alps apparently perfectly comfortably; the training begins with exposure to the air and afterwards exposure to the sunlight, solar radiation, constituting heliotherapy. Under no circumstances does Rollier allow the patient to be exposed to the sun on the same day or even on the day following his arrival in the mountains. According to the gravity of the case or the general resistance of the patient, from three to ten days are allowed for acclimatization to the altitude and training for the air cure. On his arrival, the patient is put to bed in a room, little by little the ventilators and glass doors are opened, and he is gradually accustomed to contact with the air; this is before he is exposed to the free outside air.

The next step is to wheel the patient on his bed to the large sun gallery or outer balconies adjacent to the bedroom, and beginning with one hour the first day and two hours on the second and so on, he begins his heliotherapy, properly so called. The temperature

record is kept, with the pulse and respiration; the blood and urine are examined and general conditions noted. He is clothed in linen or white flannel according to the season; he wears a white hat and is protected from direct sunlight on the face by means of a screen, and wears smoked or yellow glasses.

And now comes the peculiar and interesting method of exposure. It makes no difference where the disease is located, whether in the hip, the spine or the cervical glands, the invariable rule is to begin with the feet. These are exposed, at intervals of one hour, five times and only for a period of five minutes. The next day the legs will be exposed and the same method followed; the third day the thighs as far as the groin for five minutes three or four times; the legs for ten minutes three or four times; then the feet for ten minutes three or four times. On the fourth day the abdomen is exposed; on the fifth the thorax, when the precaution is taken to cover the heart with a damp cloth.*

If the condition of the patient permits, Rollier presents first the patient's abdomen and next his back to the sun, increasing the number of exposures to six or eight. Finally on the sixth or seventh day he exposes the neck and head with careful supervision.

The whole system of heliotherapy aims at acquiring a progressive pigmentation of the skin; this is the underlying basis of the whole matter; it is nearly always proportional to the resistance of the patient and enables him to bear the sunlight and cold air in a most surprising manner.

It would be very interesting to find out whether Rollier has ever treated any patients of the African race. We all know that negroes are prone to rickets, 'scrofula' and tuberculosis, and the mortality among them and among the American Indians is considerably greater than among whites. Inherent or racial pigmentation does not seem to afford any advantage to the tuberculous subject. But it is evident from experience in heliotherapy that acquired pigmentation goes hand in hand with the cure of external tuberculosis. The sun's rays must confer other benefits than the mere increase of pigmentation. The actinic solar rays are antagonistic to the tubercle bacillus, and that is not to be denied. The illustrations show this bronzing of the skin; it varies from a copper to a chocolate color. Without it no one could endure the sun cure for so many hours a day or engage, as some of them do, in winter sports with scarcely any protection at all. The illustrations show the young patients after months of treatment hardy and happy in the snow of an Alpine winter.

*Dr. Rollier has put his ten years' experience into definite shape and has published fourteen papers. The latest and perhaps the best of these was read at the last International Medical Congress at London, August, 1913, amplifying his elaborately illustrated paper occupying the entire number of *Paris Medical*, February 15th, 1913. Dr. Henry Dietrich's excellent description of Rollier's work appeared in the *Journal of the American Medical Association*, December 20th, 1913.

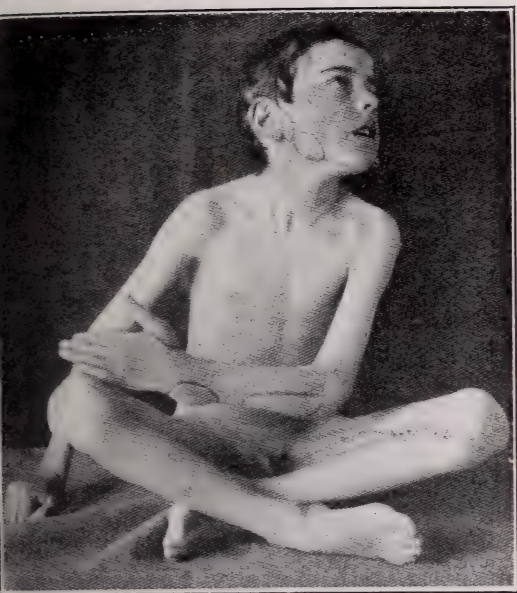


Fig. 1.—Osteitis and multiple periostitis. General condition very bad. (Dr. Rollier's Children's Clinic at Leysin.)

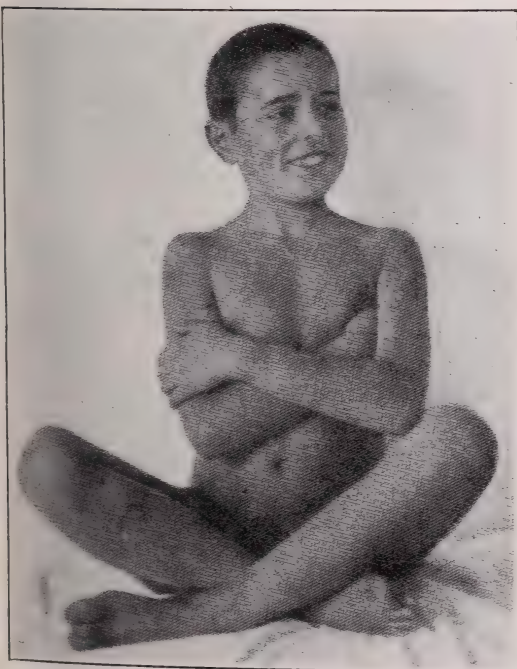


Fig. 2.—The same case. Complete cure after six months' treatment with heliotherapy.



Fig. 3.—Tuberculosis with fistulæ at right elbow. Complete ankylosis. Numerous lesions and fistulæ. (Dr. Rollier's Children's Clinic at Leysin.)

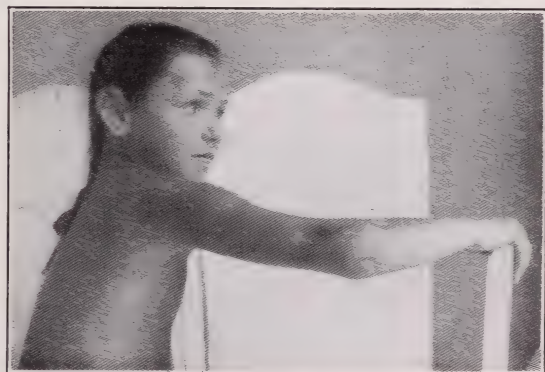


Fig. 4.—The same case six months later. Complete cure. Cicatrization of all the lesions and fistulæ.

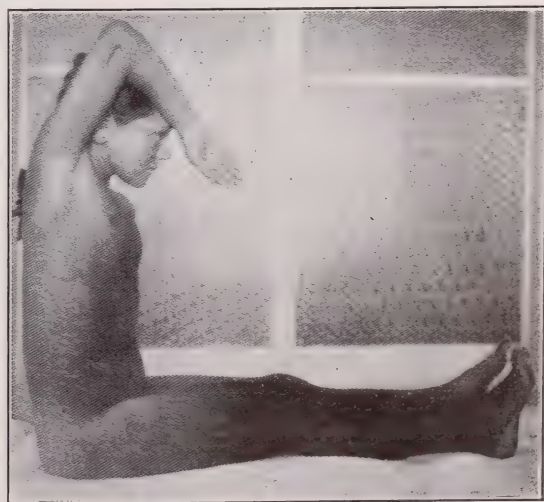


Fig. 5.—The same case showing complete restoration of the articular function.



Fig. 6.—Mode of treatment in Pott's disease. Immobilization and heliotherapy in the dorsal position. (Dr. Rollier's Children's Clinic at Leysin.)



Fig. 7.—Pott's disease treated by heliotherapy. Immobilization in the ventral position. (Dr. Rollier's Children's Clinic at Leysin.)



Fig. 8.—Gallery in Dr. Rollier's Children's Clinic "Le Chalet."



Fig. 9.—Five-year-old boy after his arrival at Dr. Rollier's Sanatorium, at Leysin. He had many bone and skin foci in the region of the right eye. Glandular enlargements. Tuberculosis of the elbow and of the forearm. Had had three previous operations. Seven fistulæ at the elbow, five on the face. Ankylosis of the elbow joint. General condition very bad.



Fig. 10.—One year later, complete cure. In place of open wounds, normal scar tissue. Healthy and vigorous.



Fig. 11.—On arrival at Dr. Rollier's Sanatorium patient had pulmonary, glandular and bone tuberculosis (thirty-two foci) and general condition was very bad.



Fig. 12.—One year later, complete cure. In place of open wounds, normal scar tissue. Healthy and vigorous.



Fig. 13.—Children very ill when they arrived at Leysin, restored to health. Ski-ing.

There is one remarkable feature of the higher Alpine resorts such as Leysin, Davos and St. Moritz, and that is that there is a vast difference between the temperature of the air in the sunshine and in the shade. Although snow may be lying on the ground, temperatures of 95 to 100°F. or even higher in the sun are not uncommon.

It has been calculated that the sunlight has considerably more actinic force at these mountain stations than at the seashore, and hence the time required for the solar cure is probably less than elsewhere. But even Rollier and others in the Swiss Alps have strongly urged the adoption of the method of heliotherapy at the seashore sanatoria, and as we have already seen this is successfully accomplished. Rollier's record of about 1200 patients and about 1000 cures is one of the greatest contributions to modern surgical progress and especially to the fight against tuberculosis.

Heliotherapy in America.—In this country there is every opportunity for practising heliotherapy for tuberculosis, but, as far as I know, only in one hospital is there any attempt to practise it in the manner described. On January 21st of the present year I revisited Sea Breeze Hospital, Coney Island, New York, in order to see what is being accomplished. Six cases of hip disease were being treated by partial exposure of the body to the sun. The patients were in bed on the balcony with the usual extension apparatus in place. General exposure, beginning with the feet and gradually involving the entire body, is not adopted at Sea Breeze, as a rule, and only the area of abdomen, hip and thigh adjacent to the diseased joint was exposed to the air and sun. Continued cloudy and unfavorable weather had prevented much progress in the newer patients who were then undergoing treatment; others who had been cured of serious tuberculous disease by the open-air method had recently been discharged. The fresh-air system is, however, well carried out, but not upon the naked body as in Switzerland and France.

The temperature on the open balcony next to the wooden wall of the building was 62° F. at noon in the sun. It was the first bright day after weeks of storm and cloud. It is probable that the very encouraging experience of the last two years will lead to the adoption of Rollier's method in all its details as modified by the less favorable climatic conditions of this part of the Atlantic seaboard.

Results at Sea Breeze Hospital in the treatment of tuberculosis of the bones, joints and glands have been so good that the city of New York has acquired a new location with 1,000 ft. of beach front on what is known as Rockaway Point, ten miles beyond Coney Island. The plot runs back about 600 ft. to Jamaica Bay and cost the city, after condemnation proceedings, \$1,250,000. The plans include an arrangement of grounds and buildings which will involve a total outlay of \$2,500,000, and there will be accommodation for 1,000 patients in the eight pavilions. Contracts for two of these

pavilions have been let and will be paid for by a fund raised by the New York Association for Improving the Condition of the Poor. The new hospital will be turned over to the city of New York and will be conducted by Bellevue and Allied Hospitals. The plans include an immense playground running back to Jamaica Bay for the use of the public.

Credit is due to Dr. John Winters Brannan, of New York, president of Bellevue and Allied Hospitals, for much of the great work which has so far taken about nine years to accomplish and for which America will be justly proud.

TREATMENT OF TUBERCULOUS BONE ABSCESSSES AND SINUSES WITH TUBERCULIN.

By W. SAULSBURY NIBLETT, M. D., of Baltimore.

When in medical literature one finds a long array of drugs and remedies for a given ailment, one doubts the efficacy of any of them. Thus, for example, the problem of tuberculous sinuses from bone is very similar to efforts to dry up a lake when the head waters and springs up in the mountains are still active.

Our primary efforts must be to care for or arrest the active disease and source of the tubercular pus, before we can expect to dry up a sinus.

The object of this paper is in the nature of a small contribution of our experience with tuberculin in sinuses and abscesses at the Kernan Hospital, since August, 1911.

Among the various methods of local treatment that have come under our own observation may be mentioned the following: (1) evacuation of the abscess and the injection of iodoform-glycerine; (2) evacuation and swabbing out the bone with carbolic acid followed by alcohol; (3) evacuation and immediate closure; (4) evacuation and drainage; (5) washing out with formaldehyde solution; (6) iodoform ether, zinc chloride solution, tincture of iodine; washing out with hydrogen peroxide, and the injection of chalk powder and petrolatum, or evacuation and injection of Beck's bismuth paste; (7) irrigation of sinuses with quinine and urea hydrochlorate or potassium permanganate; (8) vaccine used in mixed infection. One will readily conclude from the numerous methods mentioned above that the evolution of the treatment has been more or less in a chaotic state, and has not proved entirely satisfactory in the hands of orthopedists in all cases.

We have used all the foregoing methods, but have found by experience that better results are obtained by the use of tuberculin, both locally and systemically. The TR we use systemically and the OT in abscesses and sinuses. Remember to treat first of all the primary focus. As nature demands first absolute rest, first, last and at all times, we should endeavor to accomplish this all essential end by the best means possible, and recognize that the treatment of the abscess or sinus is secondary.

We must bear in mind that nature is engaged in a general as well as a local germicidal warfare, and that a well-directed assistance in building up the general condition will enable her to conquer; therefore, not only orthopedic but all hygienic measures must

be enforced, such as sufficient sleep, fresh air, sunlight, good nourishing food, proper clothes, etc. All these are important adjuvants, but too much stress cannot be laid on the importance of good food, fresh air, and sunlight, as these are the most important agents required, not only in phthisis, but in bone tuberculosis.

Other measures should be employed to improve the general condition, such as tonics and alteratives, which must be selected according to each individual case.

We have had good results from using olive oil, strychnine, tincture of nux vomica, potassium iodide, tincture ferric chloride, and syrup of the iodide of iron.

As to local treatment, we have found that the existence of tuberculous abscess does not necessitate immediate evacuation, so we find that the expectant treatment, combined with thorough mechanical treatment, often yields good results.

If the abscess is very large and deeply placed, there being no pressure symptoms, we have found that if the part is put at rest by traction and fixation and the patient allowed plenty of fresh air, sunlight, and good food, the contents of the abscess will become absorbed and the purulent material will become encapsulated. Therefore, we religiously discourage immediate evacuation of the abscess unless it has signs of secondary infection, because an abscess that is opened is not only prone to secondary infection by pyogenic cocci from the skin and hair follicles if left open for twenty-four hours, but may cause a dissemination of tubercle bacilli by way of the blood or lymph, setting up miliary tuberculosis or meningitis, or it may cause the formation of a sinus which not only will probably discharge as long as the disease is active, but is "the gateway by which death so often enters." In cases in which the patient has a great deal of pain, due to pressure on nerves, blood-vessels, or bowels, or interferences with digestive or respiratory functions, we advocate incision, evacuation of the abscess, and immediate closure. Under no circumstances do we allow an abscess to be left alone when the skin is becoming reddened from tuberculous infiltration, because it will ultimately break down and most likely become secondarily infected.

All abscesses secondarily infected should be opened at once, swabbed out with carbolic acid, followed by alcohol, which will destroy the remaining tubercular germs and the secondary infection. In some convalescent cases of bone tuberculosis, where the focus is circumscribed and easily accessible, for example in the condyles of the femur, erosion may be done, always with the use of an Esmarch bandage and a tourniquet. The cavity is swabbed out with tincture of iodine and filled with the following mixture: Yellow wax, one part, wool fat, five parts, bismuth subnitrate, 15 gr. to 1 oz. of the mixture, after which the incision is closed.

We believe this procedure has saved many joints from infection

by direct extension. This does not, obviously, apply to tuberculous foci within the joint of vertebræ.

There are certain cases, however, that refuse to heal under any local treatment, and ultimately result in the formation of an obstinate sinus. Here we have a rather difficult condition to treat, but we have had some success by the use of Beck's bismuth paste, or by the use of a chalk mixture; but in the use of the former, one has to be somewhat cautious to guard against bismuth poison, although we have had only one case. As some patients seem to have a marked idiosyncrasy for the substance, we prefer using the chalk mixture. We have also used Scarlet-Red petrolatum (10 per cent. ointment) with success. Before using the tuberculin in sinuses, we try to get rid of the secondary infection by curetting the walls of the sinus, followed by an irrigation of quinine and urea hydrochlorate, or potassium permanganate solution; after using this three times a week for two or three weeks, we use the tuberculin treatment.

Tuberculin is very stimulating to the sluggish granulations, and converts the creamy pus into serosanguineous pus.

After two, or three injections the sinuses appear healthier and the discharge is markedly decreased.

Each 10 minims of old tuberculin equals 0.5 mgrm. in normal salt solution with 0.25 P. C. phenol. One minim of this is added to 150 minims of normal salt solution as a beginning dose and given three times a week. The second week this is increased to 1-100, the third week to 1-50, and the fourth week to pure, or full strength. Of course, the dose is governed by the reaction, both local and systemic. There is some systemic as well as local reaction after the first injection. The patient's temperature may reach 101 or 101.5° F., with some lassitude, but this is less marked after the first two or three injections, and usually disappears entirely after subsequent treatment.

In the endeavor to bring the tuberculin into immediate contact with the walls of the sinus, we inject tuberculin solution into the depths of the sinus by means of a syringe or a small, soft rubber catheter, which is withdrawn as the injection is made.

Our feeling in the matter is that the sooner we get the sinus closed or thoroughly plugged, aside from the treatment of the granulation with the tuberculin or some other substance to stimulate the walls of the abscess or sinus, the better it is for the patient.

The following are a few of the typical cases in which the tuberculin application to the sinuses was employed from the wards of the Kernan Hospital for Crippled Children.

CASE I.—M. L., Female, *æt.* sixteen. Pott's disease, lumbar. Sinuses four, which had been discharging for three years. Strongest solution used 1-75. No temperature reaction. Sinuses closed in six weeks after tuberculin treatment was begun, and have not reopened up to fifteen months after the patient was discharged.

CASE II.—W. K., male, *æt.* twenty. Tuberculous knee, duration eight years. Sinuses four. September 2nd, 1912, these were discharging a great amount of creamy pus, when 150 minims of the old tuberculin (1-150) were injected. The injections were given twice a week, gradually increasing the strength. After using the tuberculin in three or four injections, the creamy pus was changed to serosanguineous pus and very much reduced in amount.

November 20th, 1912, the sinuses were healed. Patient reported at dispensary in January, 1914, and we found that the sinuses had not reopened.

CASE III.—M. H., female, *æt.* sixteen. Left coxalgia, dating from 1908. Sinuses, two, which had been discharging for four years. September, 1913, the patient came to our dispensary. The sinuses were discharging a great amount of thick, creamy pus. Sinuses closed after four weeks' treatment with tuberculin.

CASE IV.—H. C., male, *æt.* twenty-one. Neglected case of coxalgia, dating from 1905. Eight sinuses. The pus from these was extreme in amount. Tuberculin was used twice a week. The pus has decreased in amount and the character has improved; but the prognosis is not good, due to his very poor general condition.

In all these cases we use old tuberculin locally and residual tuberculin systemically. Other similar cases have been treated, but an enumeration of these would be simply repetition.

In conclusion we feel that tuberculin applied locally in the sinuses, associated with well-recognized surgical and orthopedic methods of treatment, gives the most satisfactory results.

2000 North Charles St.

MEDICAL VERSUS SURGICAL TREATMENT OF TUBERCULOSIS FROM OBSERVATIONS IN OVER 1,000 CASES.

By M. W. McDUFFIE, M. D., of New York,
Auxiliary Staff, Metropolitan Hospital, Department of Public Charity.

Before taking up the treatment of tuberculosis it is important that we first consider the underlying etiological factors and their relationship to this disease in its four stages—pretubercular, invasion, inflammatory and suppurative.

Pretubercular Stage.—Deficient oxidation is undoubtedly the underlying etiological factor of this disease with resulting acid-intoxication from fermentation, putrefaction and decay (auto-intoxication) plus infection by the tubercle bacillus. Insufficient supply of oxygen may result from (1) faulty respiratory act, (2) faulty body fluids, (3) faulty liver—the great oxidizing gland.

Treatment depends upon the causation and results of these factors.

Faulty respiratory act, either congenital or acquired, is present in the great majority of our tubercular patients. We know that oxidation is improperly performed when an insufficient quantity of oxygen is available. The results of incomplete oxidation of the elements of tissue and food is excessive formation of acids. These acids are constantly passing out of the body by the lungs, the skin and the kidneys. If the regular elimination of these acids is interfered with, they will tend to accumulate in the system, and acid intoxication will result.

Thus, our first indication for treatment in this stage is elimination of the acid-intoxication and correction, as far as possible, of the acquired or congenital condition, aided by suitable climatic treatment.

Faulty body fluids (blood and lymph) is perhaps the greatest cause of deficient oxidation.

Oxidation is always more perfectly performed in alkaline solutions. The reaction of human blood is alkaline, and like the temperature of the body, tolerably constant; but in disease, considerable variation occurs. The term resistance, so frequently used, can be measured in terms of alkalinity. "Any deficiency of oxygen disturbs the function of every cell in the organism and weakens resistance to disease." Oxidation depends greatly upon normal alkalinity, therefore, resistance depends upon the degree of alkalinity. Lowered resistance is synonymous with lowered alkalinity. Faulty body fluids or lowered alkalinity may, like faulty respiratory act, be

congenital or acquired; for example, quoting from the 1913 edition of Dudley's "Gynecology": "There is considerable evidence going to show, that deficient alkalinity of the blood, by rendering the secretions of the uterus less alkaline than normal or acid, may be a cause of relative sterility, and, by rendering these secretions more alkaline, we favor survival of the impregnated ovum." On the other hand, from experiments in animals, such birth deformities as harelip and cleft palate, have been found to result from lessened alkalinity. We are familiar with the scrawny, poorly nourished newborn babe, and even still-born of the tubercular mother. Tuberculosis *per se* may or may not be transmitted; but its main factor, lowered alkalinity or lowered resistance, is all too evident.

Lowered alkalinity may result from faulty diet or from acid-intoxication; if, from heredity or faulty diet in early life, we have a lowered alkalinity, then acid-intoxication with all its symptoms may soon develop, while on the other hand, even with normal alkalinity, if acid excess develops, we have a corresponding lowered alkalinity from the withdrawal of the alkaline bases.

The saliva, bile and pancreatic fluid are our alkaline secretions and withdraw the alkaline salts from the blood, while the acid salts are removed through the lungs, and by sweat, urine and gastric juice. This latter supplements acid elimination by utilizing it in oxidation, deoxidation and other reactions (Aulde). The withdrawal of acid, by one secretion, has a decided effect upon the reaction of other secretions. With the exception of the gastric juice, all retrograde changes are characterized by acid reaction, and the evidence of malnutrition, from faulty body fluids, is certainly apparent in tuberculosis.

Consider for a moment the chemical composition upon which our body fluids depend.

The body is built up of sixteen elements, which are in most instances united into compounds. They are carbon, nitrogen, hydrogen, oxygen, sulphur, phosphorus, fluorine, chlorine, iodine, silicon, sodium, potassium, calcium, magnesium, lithium, iron and occasionally traces of manganese.

Respiration is principally the intake of oxygen and the output of carbonic acid, not only in the lungs, but principally in the tissues. Carbonic acid and phosphoric acid of the blood are in a state of constant struggle for the possession of sodium, and the salts formed by these two acids depend on their relative masses (Kirk's "Physiology," pp. 363, 368).

Carbonic acid is formed by the decomposition of carbon or organic matter; also during the decay (slow combustion), fermentation and putrefaction (process of decomposition) of organic matter. Increased carbon dioxide impedes respiration by obstructing the intake of oxygen. Eliminated chiefly through the lungs and skin.

The salts of this weak acid (carbonic) are known as carbonates:



Fig. 1.—Acute pneumonic tuberculosis. X-ray of case illustrating indication for surgical procedure. Cured by thoracoplasty plus tuberculosis vaccine.

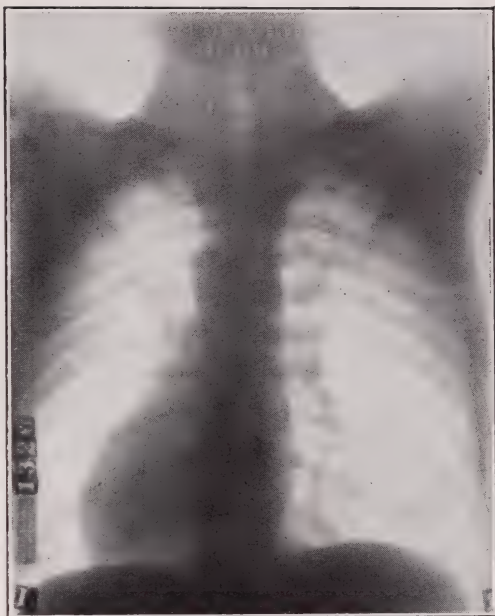


Fig. 3.—Acute pulmonary tuberculosis. X-ray of case of but three weeks' duration, with marked symptoms, septic temperature, night sweats, many tubercle bacilli and marked positive signs, but x-ray negative. A strictly medical condition.

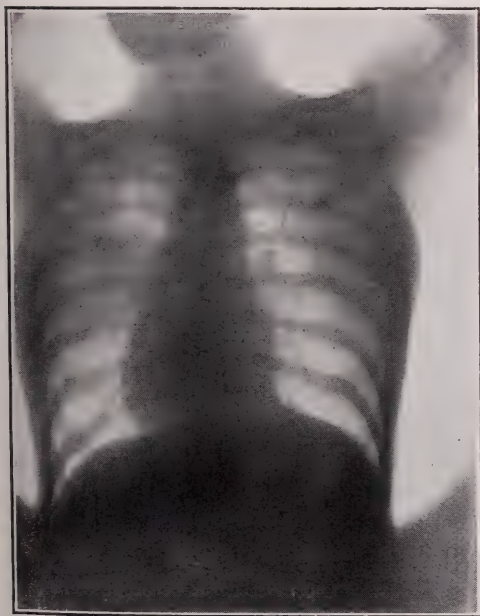


Fig. 2.—Acute bronchopneumonic tuberculosis. X-ray at end of two weeks, after first recognized symptoms developed. Invasion traced to six months previous. Illustrating the rapidity with which a tubercular medical condition may become surgical.

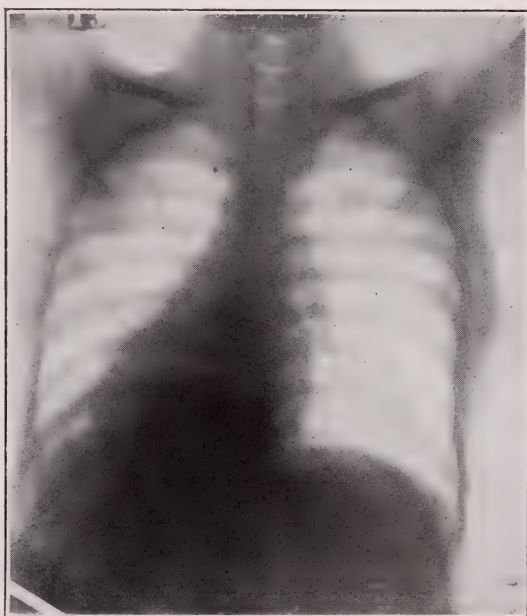


Fig. 4.—Acute pulmonary tuberculosis. X-ray of case with symptoms as of Fig. 3, cured by mercury plus elimination by intravenous injection of sodium salicylate, guaiacol, glycerine mixture. X-ray taken recently; one year later negative. Illustrating value of medical treatment in this type of case. Former weight 83 lb., now 124 lb.

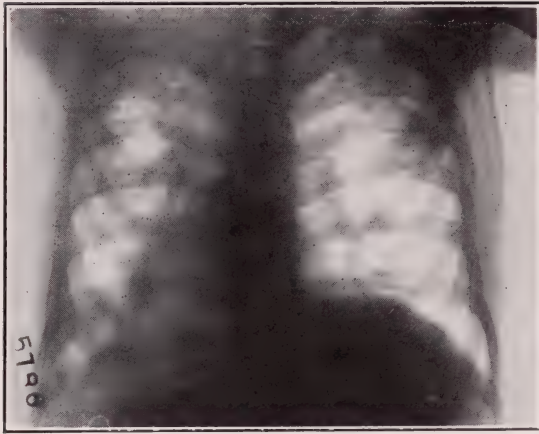


Fig. 5.—Chronic pulmonary tuberculosis. X-ray illustrating type of case for medical treatment. Showing healing by fibrosis



Fig. 7.—Tuberculosis of the jaw, elbow, sternum, ribs, improving under garlic poultices and garlic juice internally; superficial lesions healing by new connective-tissue. Previously considered a hopeless case.

TUBERCULOSIS OF SPECIAL PARTS.
CASES ILLUSTRATING THE AID, BUT
LIMITATIONS, OF SURGERY AND
EMPHASIZING THE IMPORTANCE
OF MEDICAL THERAPY.
(Figs. 6 to 14 inclusive.)



Fig. 6.—Tuberculosis of knee.



Fig. 7a.



Fig. 8.—Tuberculosis of hands and feet.



Fig. 10.—Tuberculosis of small bones of foot and ankle.



Fig. 9.—Tubercular hands; surgery utilized on left hand; now right is involved; medical therapy indicated.



Fig. 11.—Tuberculosis of finger and ankle; one foot already amputated for same condition. Illustrating limitations of surgery.



Fig. 12.—Tuberculosis of hip.

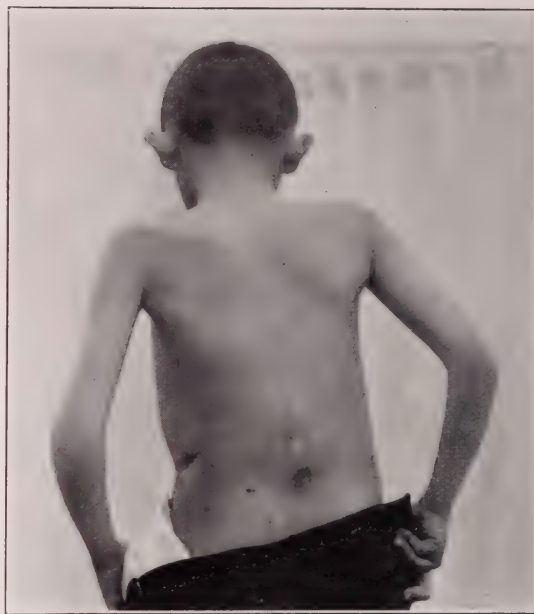


Fig. 14.—Tuberculosis of spine.

LUNGS FROM AUTOPSY.
(Figs. 15 to 20 inclusive.)



Fig. 13.—Tuberculosis of spine. Illustrating congenital results uncorrected.

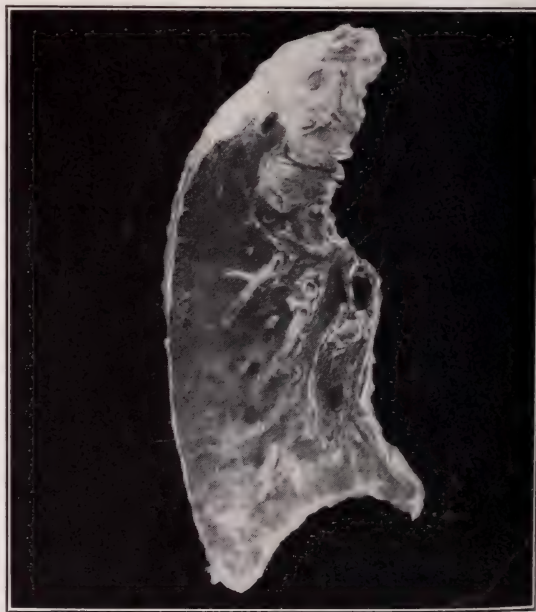


Fig. 15.—Apex healed by fibrosis—Nature's method.



Fig. 16.—Healing by calcareous deposits.



Fig. 18.—Large cavity case suitable for thoracoplasty or thoracotomy.



Fig. 17.—Lungs from autopsy showing cavities, illustrating the need of surgical procedure. Large cavity case suitable for pneumotomy.



Fig. 19.—Cavity case suitable for artificial pneumothorax.

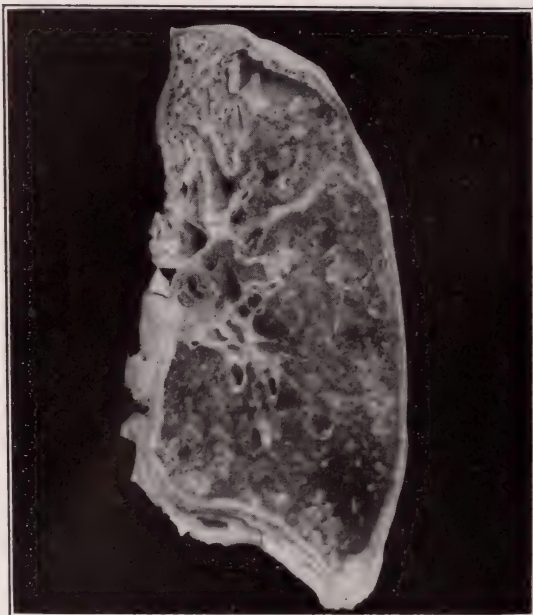


Fig. 20.—Cavity case suitable for artificial pneumothorax.

PHOTOGRAPHS AND X-RAYS OF CASES
SHOWING NATURE'S METHOD OF
DRAINING A CAVITY.
(Figs. 21 to 22a inclusive.)

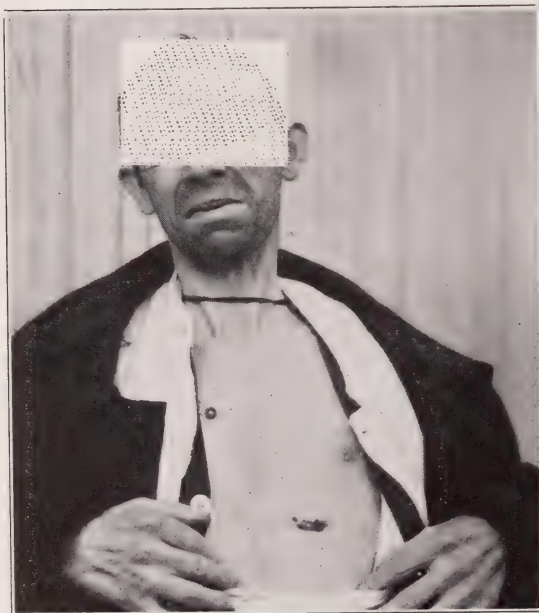


Fig. 21.—Cavity draining itself subcutaneously along sternum and forming a superficial abscess. Patient much improved after this occurrence.

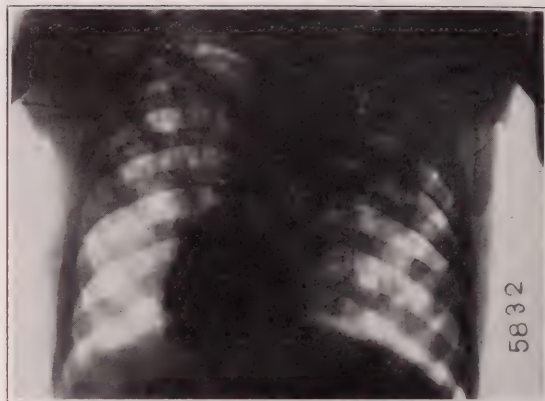


Fig. 21a.

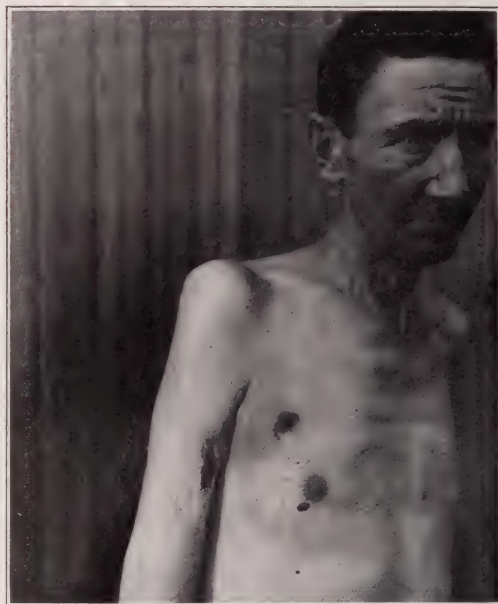


Fig. 22.—Similar case to a cavity drained and forming large superficial abscess extending down the arm.

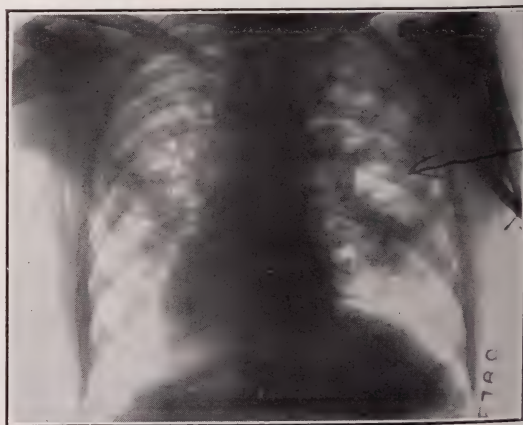


Fig. 22a.

PHOTOGRAPHS OF CASES WHICH EXCEPT FOR INCISION OR DRAINAGE ARE
STRICTLY MEDICAL.

(Figs. 23 to 27 inclusive.)



Fig. 23.—Tuberculosis of scalp.



Fig. 25.—Tuberculosis of glands of neck and chest, superficial and deep.

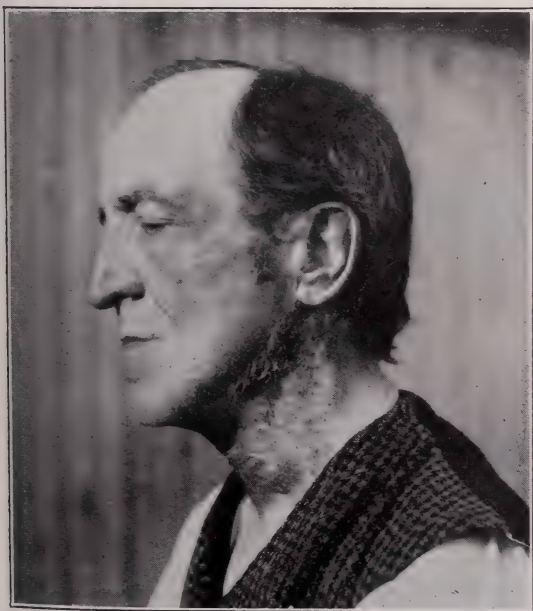


Fig. 24.—Lupus of neck; over half healed in four months with garlic.

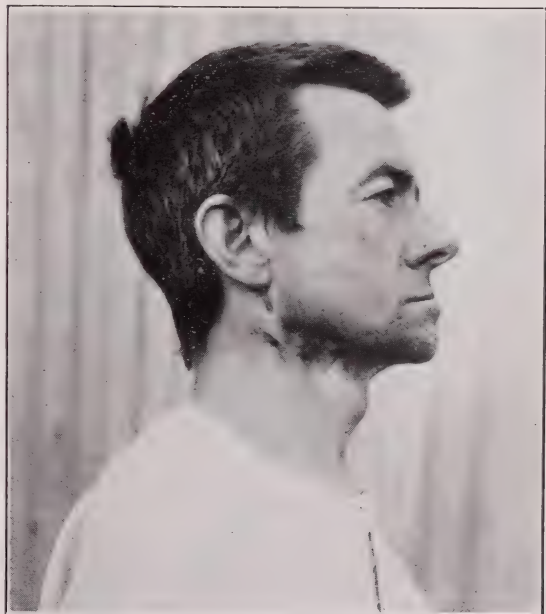


Fig. 26.—Gland case showing healing by connective-tissue.



Fig. 27.—Glandular tuberculosis of neck.

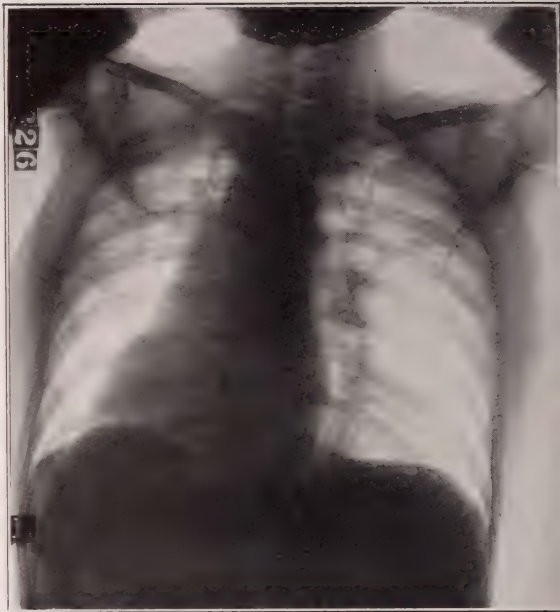


Fig. 29.—X-ray showing large cavity. Duration of disease four years; in need of artificial pneumothorax.

X-RAY PHOTOGRAPHS OF CASES IN
NEED OF SURGICAL PROCEDURE.
(Figs. 28 to 31 inclusive.)



Fig. 28.



Fig. 30.—Large cavity case; non-improved in spite of climatic and vaccine treatment.

calcium, potassium, sodium, etc. (Simon's "Chemistry," pp. 135-140).

Phosphorus found chiefly in the form of phosphates of calcium, iron and aluminum, is an essential constituent of food for plants, and through the plants it enters the animal system, where it is mostly found as tricalcium phosphate, principally in the bones which contain 60 per cent. of it. Eliminated chiefly in the urine.

One of the principal characteristics of phosphorus is its affinity for oxygen, combining directly therewith. It also combines with chlorine, bromine, iodine, sulphur, and many metals. The alkali phosphates are soluble in water (Simon's "Chemistry").

ACUTE GENERAL TUBERCULOSIS.

Chart Illustrating the Value of Eliminative Treatments.

J. F., æt. thirty-five, admitted to hospital August 7th, 1912. Diagnosis, acute general tuberculosis; von Pirquet test negative; Diazo test positive; no complications; service of Dr. McDuffie.

WEEKLY RECORD.

	Weight	Highest during week			Amount Sputum 8 p.m. to 8 a.m.	Blood % Hmn.	Urine Diazo	Sputum Analysis	Treatment
		Temp.	Pulse	Resp.					
On admission	139	102	120	26	3viii	60%	Pos.	Pos.	Rest and Diet
9- 2-12	Bed	103	115	34					
9- 9-12	Bed	103	120	36					
9-16-12	Bed	102.4	118	36					
9-23-12	Bed	102	120	36					
9-30-12	Bed	102	120	30					
10- 7-12	Bed	99	116	24					32 gtts. guaiacol intra-venously
10-14-12	Bed	99	116	24					
10-21-12	138	99.4	112	30					
10-28-12	130	99	108	24					
11- 5-12	130	99	98	26					
11-12-12	133	99	98	26					
11-19-12	134	99	108	24					
11-26-12	135	98.6	108	26					
12- 3-12	146	99	120	28	3ii	100%			
12-10-12	148	99	98	26					32 gtts. guaiacol intra-venously
12-17-12	150	99.4	112	28					
12-24-12	150	99.4	112	28					
1- 1-13	150	100	100	26			Neg.	Neg.	
1- 8-13	155	98	100	26	3ii		Neg.	Pos.	

Discharged by request—very much improved.

Thus, from chemistry and physiology, we know that deficient oxidation may result from an excess of carbonic acid and that this acidity may result from decay, fermentation, and putrefaction of organic matter. If we have an excess of this acid, there is an excess of its carbonates; as for instance, the lime deposits in a tubercular lung or so-called chalky lung; and, furthermore, we know that phosphorus, with its well-known affinity for oxygen, increases oxidation, and in excess forms the phosphoric acid. The tubercle bacillus cannot live in this media.

The chalky deposits would not be, if there had been an excess of carbonic acid; also, if the phosphorus had been present in normal amounts, there would have been no excess of lime deposit.

Cattle, fed on milk and grazed on grounds deficient in phosphorus, have milk in which the casein is deficient in phosphorus. Thus, the start of faulty body fluids in childhood by feeding with milk coming from such cows living on the products of the dephosphorized soil. Literally, "earth to earth, ashes to ashes, and dust to dust." On the other hand, we ourselves, through physiological and pathological excesses, may lose our normal phosphorus supply, and our children in turn inherit this same deficiency. When this latter takes place to any marked degree in our adult life and infection with the tubercle bacillus occurs, the results at this time, as we know from statistics, are most disastrous. Phosphaturia is a frequent phenomenon months before actual invasion.

Thus, faulty body fluids result first from an excess of acid as from deficient oxidation, or from an insufficient amount of the normal body elements, principally phosphorus. Our second indication for treatment in this stage is again elimination of the acid-intoxication, the result of deficient oxidation from faulty body fluids, and correction of the congenital or acquired condition by proper dietetic treatment and direct administration of phosphorus; also prophylactic immunization as developed by rest, exercise and vaccines. Faulty liver is the third cause of deficient oxidation. How? When the fixed alkalis are drawn upon from the blood and tissue juices for neutralization of acids, the alkalinity of the blood is lowered, but this is usually prevented by the abundance of ammonium, and our chief source of ammonium is found in the final metabolic transformation of proteids. The liver is the important organ in this process. Urea in the urine decreases and the ammonium salts are increased, thus, in a measure, an indication as to the condition of acid-intoxication.

Again acid-intoxication plays an important part either as a result or cause of deficient oxidation, and our indicated treatment is elimination and proper diet (proteid), milk and eggs in such quantity as with forced feeding; however, contraindicated especially in adults.

Stage of Invasion.—With active etiological factors as per those of the pretubercular stage, infection by the tubercle bacillus occurs. This may be by ingestion or inhalation and, if the tendency of recent researches can be so interpreted, by auto-formation. Actual invasion may occur months or years before active evidence is apparent.

The treatment of this stage is that of tubercle bacillus itself through the body fluids by therapeutic immunization as developed by rest and graduated exercise or vaccines, plus treatments as per the pretubercular stage.

Inflammatory and Suppurative Stages.—The causative factors of these two stages are but those of the pretubercular and invasion stages unchecked, and our treatment is first elimination, either medical or surgical, then treatment as per the first two stages.

TREATMENT.

In our treatment-study of this disease during the past two years, both clinical and autopsy, observations have been made with 56 treatments in over 1,082 cases, mostly in Ward Q of the Metropolitan Hospital, Department of Public Charity.

Our conclusions in general are: Tuberculosis, whether acute general, acute pneumonic, bronchopneumonic, pulmonary or chronic, and tuberculosis of any special parts, is amenable to medical treatment only when we have proper elimination, and when the infected area can be reached by the body fluids; otherwise surgical proced-



Fig. 31.—X-ray photograph of case relieved by surgery. Pneumotomy.

ures are indicated. The treatment of this disease, therefore, depends primarily on diagnosis whether a medical or surgical condition is present. Abscesses, closed cavities, and pent-up fluid, from which there is a constant absorption, should be drained or obliterated.

The inroads of this disease, in some lungs, is so rapid and of such magnitude that surgical, not medical, therapy is indicated first and foremost.

Fulminating appendicitis, with all its severity and rapidity, is but as thunder compared to the lightning-like attack of acute fulminating tuberculosis of the lungs, and we believe incidentally that many of these cases of fulminating appendicitis are but illustrations of the *locus minoris resistentia* of a masked, but certain, tubercular infection. The appendix, like the tonsils, prevents for a time systemic infection, but finally becomes overwhelmed.

On the other hand, tuberculosis of the skin, glands, bones and special organs is, as a rule, of such a nature that medical therapy should be considered first and foremost.

The treatments studied in our work have been mercury succinimide, mercury bichloride, mercury biniodide, arsenic trioxide solution intravenously, salvarsan, Fowler's solution, mineralization treatment, oils, Sherman's vaccines (P), combined bacterial vaccines (Van Cott), mixed infection phylacogen, tuberculosis phylacogen, filtrates or toxins, Dr. Duncan's autotherapy filtrate, tuberculin, antistreptococcus serum, quinine, baptisia, formaldehyde solution intravenously, salicylic acid mixture intravenously, salicin, sodium salicylate, guaiacol, vanadium, creosote, 2 per cent. aqueous solution of pure carbolic acid, phosphoric, nitric, hydrochloric, hydriodic, lactic, boric and aromatic sulphuric acids, Bannerman's solution, formula as per Bannerman's solution intravenously, saline solution intravenously, Murphy's drip, non-virulent tubercle bacillus vaccine, iodoform, iodides, garlic, phosphorus, paracentesis thoracis, thoracotomy, thoracoplasty, pneumotomy, etc.

Of these treatments but two stand out as regards anything like specific action upon the tubercle bacillus and tubercular processes, that is clinically speaking. They are garlic from the vegetable kingdom and mercury from the mineral.

Garlic contains a volatile oil, called allyl sulphide, and its medical properties depend on this oil, strongly antiseptic, and it seems to have remarkable power of inhibiting the growth of the tubercle bacillus, eliminated by the lungs, skin, kidneys and liver, and oxidizes into sulphuric acid in the system. Applied locally it is freely absorbed by the skin and penetrates the deeper tissues. Garlic gave us our best results and would seem equally efficacious, no matter what part of the body affected, whether skin, bones, glands, lungs, or special parts. Dosage used internally one dram of the expressed juice or two drops of the essential oil three times a day; externally poultices of crushed bulbs, one part with three parts of lard, or unguentum garlic (50 per cent. juice in vaseline) applied daily. Healing is by new connective-tissue formation.

For effect upon the tubercle bacillus and tubercular processes, the salts of mercury rival garlic and would seem to be next in efficiency. Mercury is easily absorbed in any form, chiefly excreted by the liver, also by the skin and kidneys. Accumulated action is a drawback when compared with garlic.

Mercury biniodide $\frac{1}{30}$ gr. three times a day internally and unguentum hydrargyri externally gave us our best results from this treatment.

The result from these two substances is due no doubt primarily to their eliminative power and secondarily to their antiseptic influence upon the body fluids.

In many cases of severe toxemia with continued septic tempera-

ture more active elimination is necessary. In such cases our best results were obtained by one of the following treatments:—

1. Normal saline 220 c.cm., temperature 106° F., also of value in hemorrhage cases, given intravenously.
2. Guaiacol 32 gtts. in 220 c.cm. sterile water, temperature 106° F., antiseptic and antifermentative, given intravenously.
3. Mixture of sodium salicylate, guaiacol and glycerine āā 32 gr. or gtts. in 220 c.cm. sterile water, temperature 106° F., intravenously.
4. 2 per cent. aqueous solution of pure carbolic acid (Bacelli's treatment), 1 to 5 c.cm. doses hypodermically or by Murphy's drip in 10 c.cm. doses, antiseptic and antifermentative; must watch kidneys.

Cases of continued septic temperature, not improving from the above, should be treated by surgical elimination (incision and drainage, thoracotomy, thoracoplasty and pneumotomy).

For making the soil unfavorable for growth through effect on body fluids, phosphorus 1/1,000 gr. t. i. d., vanadium 1/400 gr. t. i. d., and Fowler's solution 1 gtt. t. i. d., have given us our best results.

Tuberculosis vaccine was found to be contraindicated in septic cases, but rendered valuable service after elimination of the toxemic condition, and in cases not of this type.

TREATMENT SUMMARY.

1. Medical or surgical correction, as far as possible, of the congenital or acquired faulty respiratory act, as, for instance, the removal of deflected septums and other nasal obstructions, the teaching of proper breathing and assisting same by climatic treatment in its broadest sense.

2. Medical correction of faulty body fluids and faulty liver by suitable dietetic treatment rich in the principal elements, especially phosphorus, and the utilization of prophylactic and therapeutic immunization as developed by rest and graduated exercise, or tuberculosis vaccines assisted by tonic aids, such as phosphorus, vanadium, arsenic, cod-liver oil, electricity, etc.

3. Medical elimination by diet, exercise, hydrotherapy and vegetable or mineral administration; for instance, garlic, mercury, saline solution, guaiacol, etc.

4. Surgical elimination by incision and drainage, artificial pneumothorax, thoracotomy, thoracoplasty or pneumotomy.

Surgical procedure is indicated in all cases with continued septic temperature and all cases of abscess formations, closed cavities and pent-up fluids, from which there is septic absorption. This is more frequently indicated in pulmonary tuberculosis, and less frequently in bone, gland tuberculosis and tuberculosis of special parts, than commonly recognized.

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THE APPARENT TOXICITY OF INFINITESIMAL DOSES OF TUBERCULIN IN CERTAIN CASES OF PUL- MONARY TUBERCULOSIS.

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sician to the Philadelphia General Hospital, Consulting Physician
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The phenomena about to be described are so remarkable that, had the writer not observed them himself and subjected them to rigorous tests, he would be somewhat sceptical as to their actual occurrence. Accustomed as most of us are to think of tuberculin in terms of thousandths, hundredths and tenths of a milligram, and even in milligrams, it seems incredible that clinical results can be obtained from doses so small as one one-billionth and one hundredth of a billionth of a milligram. And yet in certain advanced cases reaction to such dosage apparently occurs.

In the writer's experience with tuberculin in incipient and moderately advanced cases of pulmonary tuberculosis, he had obtained more or less severe reactions with initial doses of one one-millionth of a milligram and clinical responses from doses as small as one hundredth of a millionth of a milligram. His statement in a paper published last August* that the proper method of giving tuberculin would be to begin with one-tenth of one-millionth or one-hundredth of one-millionth of a milligram was modified in a more recent paper,** on account of his experiences with some of the patients described in this article, by the following recommendations: "When the disease is active, the first dose should not exceed one-hundredth of a millionth of a milligram, or one one-billionth of a milligram. At the present time the writer would advise against the general practitioner giving tuberculin in septic cases, with high afternoon fever, and very rapid pulse after prolonged rest."

The writer is not at all convinced, nevertheless, that the far-advanced, toxic patient just described may not be benefited by tuberculin, although he is familiar with the theory that one so saturated with toxins should not have that overload augmented. It was while studying the effect of tuberculin in just this type of pa-

*The Use of a Very Minute Initial Dose in Tuberculin Therapy. (*New York Med. Journ.*, Vol. XCVIII, p. 268, 1913.)

**The Administration of Tuberculin by the General Practitioner. (*Med. Record*, Vol. LXXXIV, p. 514, 1913.)

tient, in an endeavor to obtain a dose that would not produce a reaction, that he observed the phenomena about to be described.

The patients were all undergoing outdoor treatment at the Home for Consumptives, Chestnut Hill, Pa. The symptoms complained of were described by the patients, and observed by the resident physician and the nurses, and in some instances by the writer himself. At no time were leading questions asked or answers suggested. Every effort was made to eliminate the psychic element. No patient knew she was getting tuberculin. The increase in dosage was likewise unknown to the patient. Nor was the patient aware when water was substituted for tuberculin.

The following cases will illustrate the toxic symptoms that may apparently follow the use of very minute or infinitesimal doses of tuberculin. The form of tuberculin used was tuberculinum purum, known as endotin, said by Gabrilowitch and others to produce no general reactions, and recommended to be given even to advanced cases in initial doses of one one-hundredth to one one-thousandth of a milligram hypodermically. The writer knows of no instance of its administration *per os* by anyone except himself.

The tuberculin was given by mouth in a little water the first thing in the morning, on an empty stomach. The doses that seemed to produce toxic symptoms varied from one one-billionth to one hundredth of one-billionth of a milligram.

CASE I.—A. M. P., *æt.* twenty-four, female, in the incipient or possibly moderately advanced stage, on July 6th, 1913, was put on doses of one one-billionth of a milligram of tuberculinum purum every fifth day, and at first complained of always being more drowsy the day of the dose. After several weeks this symptom disappeared, but after the dose was doubled on October 19th, the patient complained of headache on the day tuberculin was given. Sterile water produced no symptoms. The patient was free from headaches after the cessation of tuberculin treatment on November 21st.

CASE II.—E. J., *æt.* twenty-six, female, in the moderately or far-advanced stage, was given one one-billionth of a milligram of tuberculinum purum on July 6th, one five hundred-millionths on July 10th and thereafter every five days for three doses, after which the dose was reduced to one one-billionth of a milligram, except for the period between August 10th and 22nd when sterile water was given. The first dose produced no symptoms, but the patient was tired and sleepy and her appetite was not so good for about two days after the second dose. Other symptoms, such as headache, burning and weakness of the eyes, dizziness, feeling of fatigue and languor, followed other doses of tuberculin given before and subsequent to the course of sterile water, but were not observed after the administration of water.

CASE III.—E. A. C., *æt.* thirty-one, female, in the far-advanced stage, was given one one-billionth of a milligram of tuberculinum purum on July 6th, 1913, and twice that amount every fifth day thereafter until August 4th, after which it was given every third day. The dose was increased one-half August 22nd, reduced to one-tenth of one-billionth on October 31st, and again increased to one one-billionth on November 5th. Weakness, fatigue, faintness, loss of appetite, malaise occurred on the day tuberculin was given, sometimes persisting until the following day.

CASE IV.—A. C., *æt.* thirty-two, female, in the far-advanced stage, on July 6th, 1913, was given one one-billionth of a milligram of tuberculinum purum, the

dose being doubled on July 10th and again slightly increased on July 27th, August 28th, and October 3rd. The first three doses were followed by headache, fatigue, anorexia, nausea and nervousness, being more marked after the first dose.

CASE V.—B. F., *æt.* twenty-one, female, in the far-advanced stage, experienced vertigo, weakness, and headache on the day following the administration of one one-billionth and one-fifth of one-billionth of a milligram of tuberculinum purum given every fifth or third day from September 17th to October 14th, 1913, although there were no symptoms the day tuberculin was taken. Drowsiness the day of administration was the only symptom produced by one-hundredth of one-billionth of a milligram and this was not present after the third dose.

CASE VI.—E. H., *æt.* sixty-nine, female, in the far-advanced stage, showed no symptoms from one one-billionth of a milligram of tuberculinum purum given July 6th, 1913, but suffered from weakness, headache and vomiting on the days of the first two doses of double this amount.

CASE VII.—J. N., *æt.* forty-three, female, in the far-advanced stage, complained of slight vertigo on September 16th, 1913, the day she took three one hundred-millionths of a milligram of tuberculinum purum, but experienced no untoward symptoms from smaller doses taken previously and subsequently.

CASE VIII.—R. H., *æt.* twenty-seven, female, in the far-advanced stage, was given doses of one one-billionth of a milligram of tuberculinum purum and twice this every fifth day from July 6th to August 3rd, 1913 and on the evening of the day of administration experienced cramp in her left knee and ankle. When the dose was increased one-half on August 9th, she suffered from a cramp in her left elbow and forearm, while the wrist and fingers of her left hand felt twice their size, although the appearance was normal. When the dose was increased one-third, headache and nausea and drowsiness were produced, becoming less as the dose was repeated.

CASE IX.—J. S., *æt.* forty, female, in the far-advanced stage, was given one one-billionth of a milligram of tuberculinum purum every five days, beginning September 17th, 1913. She complained of drowsiness and anorexia the day the tuberculin was given and to a slight extent the day following. Even when the dose was reduced to one-tenth of one-billionth of a milligram, the patient said she felt like a limp rag the day of tuberculin and less so the next day.

CASE X.—E. S., *æt.* forty, female, in the moderately advanced stage, became nervous, weak and tired, her appetite became poor and her cough worse when given one one-billionth of a milligram of tuberculinum purum on July 6th, 1913, and twice this dose on July 10th and 15th.

INTRATHORACIC TUBERCULOSIS IN INFANCY AND CHILDHOOD INCLUDING BRONCHIAL GLAND TUBERCULOSIS.

By JOHN B. HAWES, 2nd., M. D., of Boston.

Tuberculosis is one of the most common, if not the most common, infection to which humans are liable. It is also a true 'children's disease.' Evidence based not only on reliable tuberculin tests but also on post-mortem evidence shows beyond doubt that a very large percentage of children, 50 per cent. to 90 per cent., according to different observers, have become infected with tuberculosis by the time the fifteenth year is reached. Bearing this fact in mind, then, it can readily be seen how important it is to recognize the signs and symptoms of this disease at the earliest possible moment.

It is well to remember that in the case of many children, a mild tuberculous infection may cause no symptoms whatsoever. There is a vast difference between 'tuberculous infection' and 'tuberculous disease.' Pritchard* writes as follows concerning this: "Tuberculosis is the most common of all diseases to which childhood is liable. The congenital form of the disease is practically unknown, although the phthisical diathesis is strongly hereditary, and predisposes to the subsequent development of tuberculous processes. The incidence rate rises from zero at birth to 90 per cent. at the age of fourteen. Although tuberculosis is a terribly fatal disease during the first few months of life, the mortality rate among those affected rapidly falls to about 2 per cent. at the end of the fourth year. Thus as far as tuberculosis is concerned, children may be said to be highly susceptible, but, with the exception of the first two years of life, little liable to fatal results."

Tuberculosis in childhood is primarily a disease of the lymphatic system. By the time the lung itself is involved, the process is a well-advanced one, and one that offers no difficulty in diagnosis. In this article, therefore, I shall confine my remarks to the diagnosis of the disease in its early stages, when the bronchial lymph-glands are affected and little or none of the lung itself is involved. Here, as in adults, the importance of constitutional signs and symptoms cannot be given too much emphasis. Only in the rarest of instances, even with *x-ray* evidence, is it possible to decide definitely from the examination of the chest alone that tuberculous bronchial glands are present, and, of still greater importance, that they are *the cause of symptoms*.

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These constitutional signs and symptoms above referred to may be as follow:—

(a) Loss of weight, or, of greater importance, failure to gain weight.

(b) Malnutrition, despite what seems to be adequate and proper nourishment.

(c) Continuous fever, or a constantly subnormal temperature associated with a high pulse.

(d) Anemia.

(e) Debility, languor, undue fatigue, irritability, loss of appetite, or a capricious appetite.

It is true that any or all of these symptoms or conditions may be due to causes other than tuberculosis. These should be carefully borne in mind and eliminated, if possible. Such conditions, however, as rickets, chorea, endocarditis, improper feeding, etc., if present, are usually strikingly evident. When these symptoms exist *without apparent cause*, even if the signs in the lungs are slight or absent, it is safe to make at least a provisional diagnosis of a tuberculous infection as the cause of symptoms. When, in addition to these, there are present certain signs and symptoms referred to the lungs, the diagnosis is conclusive. Such signs and symptoms referred to the lungs may be:—

(a) Cough, usually dry and throaty, often of brassy quality and paroxysmal in nature, sometimes closely resembling whooping-cough. There is usually no sputum and no obvious cause for such a cough, such as enlarged tonsils, etc.

(b) Impairment of resonance at the level of the second intercostal space in front and in the interscapular region behind. The possibility of an enlarged thymus, or a dilated or hypertrophied heart must be borne in mind, and, if possible, ruled out. The latter is usually self-evident, but an enlarged thymus may offer one of the most difficult problems in diagnosis.

(c) Bronchial breathing and bronchial whispered voice heard on auscultation, over the vertebræ below normal limits. This is known as d'Espine's sign. Different observers place this 'normal limit' at different levels. In my own work, I consider that bronchial whispered voice heard below the level of the third or fourth dorsal vertebra or the level of the spine of the scapula is abnormal. A negative d'Espine sign is of no significance one way or the other; a positive one is a small bit of confirmatory evidence that there may be enlarged bronchial glands at the root of the lung which are acting as a conducting medium for the whispered voice. It gives absolutely no evidence, except on the mere doctrine of chance, as to whether such glands are tuberculous or not.

(d) Signs of intrathoracic pressure, such as enlarged veins on the chest, unequal pupils, hoarseness, paroxysmal 'brassy' cough, and a peculiar strident or sibilant quality to the breath sounds.

(e) Enlarged tuberculous glands in the neck or elsewhere suggesting the possibility of similar glands at the root of the lung.

It is in the case of children that the tuberculin test finds its greatest field of usefulness. The von Pirquet or cutaneous test is by far the best one to employ. The technique of this is already well known, and is so simple as to require no description. In this test, a negative reaction is of more value than a positive one. A negative skin tuberculin reaction in a child of ten years or under, carefully performed, is as good evidence as can be obtained that tuberculosis is not the cause of the child's condition. This statement, of course, assumes that none of those conditions, such as advanced tuberculosis in the lungs or elsewhere, a recent attack of measles or other acute disease, which have been known to cause a negative reaction, is present.

A positive skin tuberculin reaction, while of great importance, by itself is not enough on which to base a diagnosis of clinical tuberculosis. It simply means that somewhere in the child's body there is a tuberculous focus. If, in addition to a positive reaction, constitutional signs and symptoms are present, even without any of those referred to the lungs as mentioned above, a definite diagnosis of tuberculosis, requiring prompt and aggressive treatment, is justified.

The *x*-ray, like the tuberculin test, in my opinion, is of far greater value in children than in adults. While it is only in comparatively advanced cases that tuberculous bronchial glands are of such size as to cause marked dullness or other very striking signs in the chest, a careful *x*-ray examination, made and interpreted by an expert, will show such glands long before they have attained great size, although quite capable of producing marked constitutional symptoms. It should also be borne in mind that the *x*-ray after all shows only shadows, and gives absolutely no indication as to whether any given process is old or recent, active or inactive. *X*-ray evidence alone never justifies a definite diagnosis of what we know as clinical tuberculosis.

In summarizing the important points in the diagnosis of intrathoracic tuberculosis in children, therefore, I would emphasize the following:—

- (1) A careful study of constitutional signs and symptoms is of the utmost importance.

- (2) A cutaneous tuberculin test should be made. If negative in a child under ten years, with the exceptions mentioned above, tuberculosis can be ruled out.

- (3) An *x*-ray examination made and interpreted by an expert offers much valuable confirmatory evidence.

- (4) Signs and symptoms referred to the lungs may or may not be present. If present, they are of great importance in making the final decision. It is well to bear in mind that in many cases a diagnosis of tuberculosis is justified when such signs and symptoms referred to the lungs are absent or very slight.

ON THE VALUE OF ANIMAL EXPERIMENTATION IN
TUBERCULOSIS.

By H. J. ACHARD, M. D., of Asheville, N. C.

The question, which is often raised, whether animal experimentation has enabled us to learn anything more in regard to tuberculosis than we could have learned by other means, is pertinent, even though it has been answered repeatedly.¹ The best reply to it will be found in a study of the history of tuberculosis research. For our purpose we may, following Landouzy,² consider the history of tuberculosis-study in three periods. To these the writer will, however, venture to add a fourth period in which we are at present and which dovetails with the third, just as the previous periods could not be strictly separated by dates but gradually merged one into the other.

The first, symptomatic or Hippocratic, period dates from antiquity and ends at about the end of the eighteenth century. This period was characterized by clinical observation and by the purely empirical nature of its researches for the treatment of consumption. From the Ayur Veda of Susruta and the writings of Hippocrates of Kos down the ages, Celsus, Aretaeus, Galen, the Arabian physicians, Bonet, Sylvius, Richard Morton, Morgagni and many others were practically limited to the study of the clinical disease the description of which, in their writings, is excellent; and they were forced to try empirically a variety of remedies that was restricted only by the limitations of human imagination, in the attempt to find an effective remedy for this disease which was more spite of the closest study it was impossible to determine the true prevalent and demanded more human lives than any other. In cause of consumption which was attributed to heredity, to blood crasis, diathesis, etc., and was only here and there considered contagious. With Bonet³ and Sylvius,⁴ pathological researches, which had until then been only very isolated and of necessity inconclusive, were taken up in good earnest by various anatomists, and Sylvius was the first to suspect one cause of phthisis in *tubercles*, little nodules in the lung tissue, which gradually enlarged and broke down, forming ulcerations, and which he believed to be glandules. Richard Morton⁵ attributed every variety of phthisis to these tubercles, but what they were he could decide as little as his predecessor.

The second, anatomical or diagnostic, period might suitably be called the period of pathological research. It commenced (after

Bonet, Sylvius, Morton) with Matthew Baillie,⁶ Bayle,⁷ Laënnec,⁸ and found its great exponents in the French and German pathologists of the last century. Virchow especially devoted much attention to the problems of tuberculosis, and in the second half of the century the pathology of tuberculous diseases may be said to have become as well understood and established as it was possible to be until the true etiology of the disease had been discovered. During the second period the origin of phthisis from tubercle was firmly established and the recognition of the disease was facilitated by Auenbrugger's discovery⁹ of percussion and Laënnec's discovery of auscultation. Among the great men who gave the best efforts of their acute minds to the elucidation of tuberculosis problems were such illustrious scientists as Bayle, Laënnec, Louis, Cruveilhier and many others in France; Reinhardt, Virchow, Niemeyer and others in Germany; Rokitansky in Austria; Stokes, Thomas Reid, Wm. Cullen, Sir James Clark and others in England; Benjamin Rush, Austin Flint, Loomis and others in our own country. Yet, although the pathological anatomy of tuberculosis and the clinical manifestations of phthisis were studied minutely, and although the nature of the disease was fully investigated, the cause of tubercle remained a mystery almost as much as it had been for many centuries.

All the careful, painstaking, and persistent efforts and investigations of the first two periods of tuberculosis study were not able to lift the pall which had lain on the minds of physicians and laity alike with respect to this terrible disease against which nothing seemed to prevail. If some pathologists had observed distinct and even frequent evidences of healing, in the shape of obsolete tubercles which had not advanced to extensive tissue destruction, if Benjamin Rush¹⁰ in our country, the Rev. Andrew Stewart, M. D.,¹¹ in Scotland, Bodington¹² in England, Brehmer¹³ in Germany had insisted on the curability of phthisis by fresh air and diet, these isolated views were ridiculed and crushed by the prevailing hopeless conviction that consumption was incurable. Predoehl,¹⁴ one of the few historians of tuberculosis study, writing in 1888, said about these two periods: "It is not without being deeply moved that the physician can devote himself to the study of the history of a disease which had decimated mankind with a constant and ever increasing force as far back as we can see into the distant past. From the earliest infancy of our science to the period of deliberate and vigorous manhood in which it claims to be at the present time, it has battled against the insidious plague, always with like uncrowned effort, with the same unsuccessful and vain exertion. What efforts and night-vigils, what talents and what mental acumen have been wasted during the last two thousand years against a disease which persistently snatched its victims with the same pale insolence and insistence! What proud hopes

and splendid illusions excited the minds of masters and pupils! . . . And what (to tell the truth) is the result of all these endeavors, what is the plain unvarnished truth concerning the outcome of all these illusions? . . . What is, at this day, the answer to such a question? Thanks to the tireless advance in the investigations of our subject, the etiology of tuberculosis has apparently attained a definite elucidation; the sequence of the pathological processes may now be arranged into a complete picture; but what about the prognosis of the disease? Was not one of the most recent clinical textbooks,¹⁵ which is one of the first to deal with the subject of tuberculosis in the light of its new etiology, constrained to admit that ordinarily the certain diagnosis of phthisis must be considered as synonymous with a certain fatal prognosis?"

The third period of tuberculosis study is the experimental or etiological period; it commenced with Villemin and was continued by Koch. Although the view, that consumption is communicable from person to person, dates back to antiquity, and although it was never given up entirely, at least in southern countries, while northern authors either denied or at least doubted its justice, the infectious nature of consumption, or better tuberculosis, was not established until Villemin made his notable communication to the Academy of Medicine at Paris, December 5th, 1865, and until he was fully vindicated and his findings were completed by the demonstration of the specific virus by Koch, in his address before the Berlin Physiological Society, March 24th, 1882. The studies and the results of both men, with their inestimable beneficial consequences for mankind and, indeed, for the animals themselves, would have been impossible without experiments on living animals.

As long ago as 1843, Klencke had asserted that tuberculosis can be inoculated, and had succeeded in producing experimental tuberculosis in animals by infecting them artificially with tuberculous material. Neither his nor the very few other experiments which were made during the last century, however, could exert any decided influence upon the views of scientists until these were forced to occupy themselves with the problem by the overpowering evidence adduced by Villemin. In several communications to the Academy,¹⁶ and later in his "*Etudes sur la Tuberculose*,"¹⁷ the author described the course and results of his attempts to transmit tuberculosis to healthy animals, principally rabbits, by inoculating them with tuberculous material of various origins, such as tuberculous tissue, sputum from consumptives, caseous material, tissue from pearl disease (bovine tuberculosis), and his final proofs by causing inoculation-tuberculosis in rabbits and transmitting the disease from these animals to other healthy rabbits. All these experiments had been so successful that Villemin felt himself justified in adding as subtitle to his book on tuberculosis: "*Rational and Experimental Proofs of its Specific Nature and Infectiousness*."

In producing tuberculosis in healthy rabbits by infecting them with tuberculous material, Villemin demonstrated that the disease is infectious; by transmitting it further, from one artificially infected rabbit to a healthy rabbit, while control-experiments with other pathological or indifferent material failed to be followed by tuberculosis, he proved that tuberculosis is a disease *sui generis*, due to a definite, specific, infectious agent or virus which produces the disease in man and in non-immune animals while it is harmless for immune animals; and this specific infectious virus alone is responsible for the disease in so far as, without it, there can be no tuberculosis. In order to complete the chain of evidence, it remained only to discover this specific virus and to ascertain its nature.

It is not to be wondered at that this astounding discovery should find not only enthusiastic adherents but also violent antagonists, and during the following years many experiments were made tending to disprove the correctness of Villemin's conclusions. Gradually, however, the opposing opinions became less numerous, especially after Cohnheim and Salomonsen¹⁸ had published the results of their beautiful and conclusive experiments in which they had produced tubercle in the eyes of rabbits; so that late in the seventies of the last century the tuberculous virus, whatever it might be, was generally accepted as existing. Indeed, a contagionistic school had arisen, according to whose views it was sufficient that the tuberculous virus should be established in the body for tuberculosis to follow with certainty (Cohnheim).

The next important step was the demonstration by Koch¹⁹ of the tubercle virus, which he proved to be a rod-shaped micro-organism and designated as *B. tuberculosis*. By intricate and tedious methods of isolation and staining, which in greater part had to be developed and elaborated, and which, for a long time, seemed unpromising, he finally succeeded in finding this rod which was always present in tuberculous tissue and could be cultured from it; which, on being inoculated into healthy experiment animals, rendered them tuberculous; which could again be recovered, by culturing, from the organs of these artificially infected animals and would then transmit the disease further on being inoculated into other healthy animals. The chain of evidence was complete; tuberculosis was shown to be due to the tubercle bacillus, without which the disease could not occur. Rarely has an important discovery been proved and vindicated at its first announcement by such complete and convincing evidence as was supplied by Koch in his address on the etiology of tuberculosis; and, conclusive, complete and definite as it was, and far-reaching in its beneficial effects for man and animals alike, it would have been impossible but for experiments on living animals.

In the light of the acquirements of Villemin and Koch, and of

the later acquirements which are based upon them, the quotation given above from Predoehl's book arouses a feeling almost of pity. How different from his hopeless and discouraged admission of defeat, written less than a generation ago, is the attitude of clinicians at the present time! What all the pathological investigations of the nineteenth century, all the clinical and therapeutic experiences of over two thousand years could not accomplish; a hopeful, courageous and confident crusade against the White Plague, that has been inaugurated with enthusiasm and has been conducted, already with a modicum of success, through the knowledge acquired by means and with the aid of animal experimentation. If to-day we are able to diagnose the presence of tuberculosis before it has entered its destructive stage; if, therefore, we can, with the knowledge gained in the laboratory, in the sanatorium and by the bedside, arrest the process and prevent its extension into consumption; if we have learned how to limit the extent of contact-infection by suitable prophylactic measures, and if we may truly assert that tuberculosis is curable and preventable, we owe it to animal experimentation. Although the clinical disease still demands altogether too many victims, and although much remains to be done before it can be conquered, the beginning is made and the struggle is a hopeful one.

We cannot arrogate to ourselves of to-day a greater wisdom, a higher efficiency, than was manifested and brought to bear upon their problems by the illustrious pathologists of the last century; nor can we, with justice, exclusively attribute the greater acquirements of the present to improved instruments and appliances, particularly to the far superior modern microscope. True, if Laënnec, Louis, and others could show such splendid results of minute observation with the aid of little more than magnifying lenses, and if the genius of Virchow was enabled to determine the true nature of many pathological riddles and to establish the theory of Cellular Pathology, than which few productions of man's reasoning power exerted a greater influence, although his microscope was far less efficient than ours—what would these men not have accomplished, could they have worked with the powerful and all but perfect microscopes which to-day are found in every laboratory, in almost every physician's study! Burdened with their handicaps, the investigators of the nineteenth century, until Villemin, moreover had to content themselves with inquiring into the end-results of disease-processes, with the study of pathological anatomy, in which they attempted to reconstruct the evolution of the processes that had produced the lesions which they discovered at autopsy. Now the animal experiment enables us to study the progress of the disease from the earliest beginnings, to follow the course and localization of infection and the manner in which it leads to pathological lesions.

Aside from the fact that, until Villemin, the infectious nature of tubercle, the existence of a tuberculous virus had been suspected only by comparatively few investigators, experimental work had been handicapped by the absence of similar prior work. Except for Klencke, whose experiments antedated those of Villemin by twenty years, the latter was the pioneer in the application of the animal experiment to tuberculosis study, and his experiments established a precedent, a *modus operandi* for others to follow, to modify and to develop.

Further, aside from researches in physiology, animal experimentation was still comparatively a new method of study. Prior to the discovery of anesthetics it was for many reasons unsatisfactory, both in its actual conduct and in its results. With the inception and the development of pathological physiology and with the demonstration by Villemin that tuberculous processes can be produced at will in experiment animals, the opportunity for deliberate and fruitful research was afforded, and the second or pathological period of tuberculosis research gradually merged into the third period, in which the advance was far more rapid than it had ever been before, owing to various factors, each one of which deserves its share of credit, and of which we may mention improved methods of investigation, improved instruments, anesthesia, and the general adoption of the animal experiment.

The importance of the third period is far from being exhausted by a recital of the discoveries of Villemin and Koch. The immediate results tended to a better understanding of the tuberculous processes and to an earlier diagnosis of the disease which the last years have still further improved upon. It would lead us quite too far to enter more deeply into all the possible angles from which the subject might be considered, and it must suffice merely to hint at all the advantages that accrued to medicine by these great discoveries.

The birth of modern medicine is indissolubly connected with the names of Louis Pasteur and Robert Koch, and both may be said to have founded the modern science of bacteriology upon which the recognition, the understanding and the treatment of perhaps most diseases depend, and which are essentially impossible without animal experimentation. It cannot be insisted upon too strongly what an immense contrast exists between the acquirements and results of the first two and the last two periods of tuberculosis study. The former, extending over more than two thousand years, could not go beyond the pathology and diagnosis of consumption, that is, the destructive stage of tuberculosis, limited as they were to clinical and anatomical observations, while the treatment never went beyond the basis of empiricism which was *de facto* experimentation on human subjects. The last two periods, commencing little over forty years ago, succeeded in this short time, with the

aid of animal experimentation and, of course, of other recent discoveries, in establishing the true etiology of tuberculosis, the connection of consumption with tuberculosis and, following it, the principles of the etiological or causal treatment of tuberculous affections, making it possible to-day not only to recognize the disease at a stage when tissue destruction has not yet occurred or has advanced only to a slight degree, but also to treat this early disease successfully. And, last of all, animal experimentation has enabled us to prevent tuberculous disease from developing, in spite of infection having occurred, by successful specific antituberculous immunization.

The fourth period of tuberculosis study, which the writer ventures to suggest in addition to the three established by Landouzy, is that of immunization or preventive treatment. It was inaugurated by the attempts of von Behring, Koch and Schuetz and others to immunize cattle against epidemiological or stable infection. The principles of immunization or preventive treatment, which is designed to apply those of vaccination against smallpox to a successful prophylactic immunization against tuberculosis, were adapted for treating children and adults living in infected environments with tuberculin which, however, is unfortunately not capable of conferring an active antibacterial immunity to the tubercle bacillus. The recent attempt of Friedmann²⁰ to produce such an active antibacterial immunity by means of intramuscular or intravenous injections of living tubercle bacilli isolated from turtles, is based on the idea that the living virus alone can stimulate the organism to the establishment of an effective immunity; but von Ruck²¹ has shown that, in tuberculosis, the living virus is not only dangerous, but that it is fortunately not needed in order to obtain the desired end. It has been demonstrated conclusively, first in the animal experiment and then clinically, that his vaccine, prepared from soluble constituents of the tubercle bacillus, actually produces an energetic and efficient immunity against the tubercle bacillus, and that it protects the immunized subject against an experimental infection which is far more virulent and massive than the ordinary stable infection; that it protects vaccinated persons against any infection which they may already have acquired and also against any epidemiological infection to which they may be exposed. It is sixteen years since von Ruck²² first published his results with soluble products of the tubercle bacillus, and recently these are being confirmed, and his principle of using the soluble products instead of whole bacilli is being adopted, more particularly by Much and Deycke in their experiments with the partial antigens.

The specific remedies against tuberculosis, which have been elaborated since Koch announced, in 1890, what is now known as his Old Tuberculin, have enabled us to supplement the customary hygienic, dietetic, climatic and general modes of treatment, so that

the employment of these remedies enables us not only to shorten the time of treatment materially, but also to render the clinical results more permanent. Being based entirely upon experiments in animals and being impossible without them, it may be said that the entire modern treatment of tuberculosis, which is so far superior to the old empirical treatment, is due wholly to the aid of animals upon which the necessary experiments are carried out; nor are these animals merely the servitors of mankind in this respect; they themselves benefit from the discoveries which have been made with their assistance, for the crusade against tuberculosis is not limited to mankind but extends to, and tends to protect, domestic animals as well as the animals in zoological gardens, in fact all creatures with which man comes in contact.

At the recent Antivivisection Congress in Washington²³ the medical profession was challenged to show what animal experimentation had accomplished for medicine, and thereby for humanity, that could not have been determined by other means. This question is put regularly by opponents of medical progress and has been answered as frequently as it has been asked,²⁴ yet it is constantly reiterated with an airy disregard of what medical men may have said in reply, and it is invariably accompanied by the customary fanciful and, sometimes, deliberately false accusations of needless cruelty, on the part of the experimenters, perpetrated upon defenseless animals. Moreover, a number of American scientists were accused by name of having experimented on human subjects, more particularly on children, and of having inoculated them with the germs of serious and 'vile' diseases. The scientists who were thus distinguished by these fanatics at their congress, were especially the most prominent workers at the Rockefeller Institute (Flexner, Noguchi and Carrel) and von Ruck of Asheville, N. C.

It is needless to say that the charges of experiments having been performed by these men on children are false and that, in no single instance, were the children who were treated by them exposed to the slightest danger of acquiring an infectious disease. Noguchi's luetin cannot produce syphilis any more than tuberculin can produce tuberculosis, for the simple reason that neither remedy contains the living, virulent germs of these diseases. Von Ruck's vaccine was not 'tried' on the orphan children at Thomasville who were immunized with it and for whom the ladies and gentlemen assembled in congress expressed such touching concern. The children were treated with this remedy because they were either tuberculous, or infected and in danger of becoming tuberculous; the treatment was invariably followed by the happiest results, as is evident from the publications of their attending physician²⁵ and from the remarks published by their superintendent.²⁶ In those cases in which the administration of the vaccine remained without apparent results, the reason is that the children in question were not tuber-

culous although they were probably infected. The vaccination, far from injuring them, produced an active immunity in their organisms, and will protect them against any subsequent epidemiological infection as well as against any infection which may exist latent in their organs, and will in this manner protect them from becoming tuberculous.

It is characteristic of the charges against experimenters made by antivivisectionists that actual acquirements and facts are blithely passed by as though they did not exist, or they are even denied flatly. The latter has often occurred in relation to vaccination against smallpox, the antitoxin treatment of diphtheria, Pasteur's treatment of hydrophobia; and these denials are often made by persons who have no knowledge of the disease in question, who are not physicians, and who do not understand the problems which they discuss with such fatuous assurance.

Nobody, be he antivivisectionist or research worker or not, would approve of wanton cruelty to animals. The Society for the Prevention of Cruelty to Animals numbers among its most active members many notable physicians and investigators in infectious diseases, and these are, as a rule, very fond of animals and keep them as pets. The writer knows from his own personal observation and experience that the animals in medical laboratories are not treated cruelly and that they are not abused. They are well taken care of and treated considerately. In fact, without such treatment the experiments for which they are used would be defeated.

This article was not written, primarily, in reply to the question raised at the Antivivisection Congress. That would be useless, for the members of this congress do not wish to know the truth since it would deprive them of their occupation. It was written for the purpose of taking stock, as it were, of what we owe to the animals themselves, in regard to tuberculosis, one of the most important and most interesting diseases that affect mankind and animals alike.

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THE VALUE OF TURTLE TUBERCULIN IN THE HOME
TREATMENT OF TUBERCULOSIS.

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The most perplexing and most common problem confronting the physician in the treatment of tuberculosis is the management of the poor patient. Even if the patient can spare the time to enter a free sanatorium, the generally prevalent crowded condition of all these institutions often necessitates waiting until he has passed beyond the incipient stage. The man whose condition of life will not allow him to enter a sanatorium, and he whose case is too far advanced to make his residence there desirable, must be provided for.

Provision for this contingency must consist in bringing into the home, as far as possible, the benefits to be had in a sanatorium. The most fundamental of these benefits is hygienic surroundings. Next comes the adjuvant to hygienic surroundings—proper diet. Education in hygienics and dietetics, then, is the first and cardinal feature of home treatment.

These 'constitutional' methods of resisting the inroads of tuberculosis act in no other way than by giving Nature a chance to assert herself. They enable the affected organisms to resist to their fullest power the advance of antagonistic bodies. They do not stimulate the organs artificially, but they do enable them to bring all their own natural resistance to the front.

Every physician knows the steps that must be taken to insure to the tuberculosis patient such surroundings as may give him the best opportunity to improve himself and protect others, and the diet which best furthers his condition. These need not be discussed here.

The third and most perplexing feature of home care of the tuberculosis patient is the form of medical treatment that will best combine with proper surroundings and proper diet to improve his condition, and at the same time will not interfere with his daily occupation.

The writer's experience, like the body of medical experience in general, has shown him that the best hope for the tuberculosis patient, who cannot travel to a suitable climate, lies in the relief and cure offered by home treatment with specific tuberculin.

Any physician familiar with tubercular treatment will recognize that tuberculin has done and is doing remarkable work towards the relief and cure of the disease. It produces both active and passive immunity. First, it excites the organism itself to prepare actively the specific protective bodies; and secondly, it supplies to the human body the protective materials already formed in other organisms.

The use of tuberculin is not antagonistic to the human body, nor radically different in its effect upon it from the effect of the ordinary treatment by regulation of diet and creation of sanitary surroundings. In stimulating the human organism to the production of protective bodies (antibodies), which it is not of itself able to form in sufficient quantities, tuberculin simply carries the work done by proper surroundings and proper diet one step further.

It adds to the natural response attained by hygienic and dietetic treatment an artificial immunizing substance which tremendously reinforces the morbid tissue, attacking directly both the tubercular toxin and the tubercular foci in the lungs, and increasing the flow of blood through the diseased part. In this way it imitates and reinforces the natural processes of self-healing. Therefore, instead of being antagonistic to the usual constitutional treatment, the best results are obtained by joining the tuberculin treatment with it, the one aiding and reenforcing the other. Experience has shown that the treatment of tuberculosis with tuberculin is the most efficient single method of counteracting the disease thus far evolved.

The tuberculin treatment to-day is carried out in a gentle and gradual method which begins with small doses and increases them only in small amounts, so that strong reactions are avoided. Sensitiveness to tuberculin is different in individual cases, and the treatment must consequently be strictly adapted to the individual in its administration. Regular examination of the lungs must be a part of the routine, and an accurate notation and comparison of all the physical signs must be made.

Granted that dietetic and hygienic treatment, combined with the use of tuberculin, gives the best effects in the home care of tuberculosis, the question arises, Which tuberculin is to be used? Obviously that form of tuberculin treatment which minimizes the danger of strong reactions is to be preferred. The administration of human tuberculin, for example, while it unquestionably has done much in arresting tuberculosis, frequently brings on just these undesirable complications.

Experience extending over some time has shown the writer that the tuberculin which combines the two qualities of great efficiency and minimum reaction, and which can be used in very advanced stages of the disease, because even large doses do not bring violent reactions, is turtle tuberculin.

In his use of the Piorkowski turtle tuberculin, the writer has never seen the slightest tendency toward these reactions, and this combined with the unquestionable results he has obtained with it, leads him to recommend it as the best possible adjunct to hygienic and dietetic treatment in the home care of tuberculosis. With it, the writer has been able to treat, with good results, every uncomplicated case of pulmonary tuberculosis of the first and second grades that has come under his observations; and even those cachetic consumptives, who, in spite of a bad state of general health and a delicate appearance, have only slight physical signs in the lungs, have responded well to the treatment.

The hope then for the tuberculosis patient whose circumstances will not allow him to make the climatic changes necessary to the arresting of the disease, or even to be idle while under treatment, lies in the combination of proper hygienic and dietetic regulation with a form of medical treatment that will not interfere with gaining his livelihood.

In support of his contention that the Piorkowski turtle tuberculin, an extract of the tubercular bacilli of the turtle, containing neither live nor dead germs, is the best form of medical treatment that could be given the home patient, the writer should like to summarize briefly the results that have been obtained by other physicians and himself with that remedy, and against them, a brief outline of the results attained by the use of live germs by Dr. F. F. Friedmann as reported by Dr. Harry Lee Barnes in the *Providence Medical Journal* of November, 1913, p. 254:—

Friedmann's Results.

1. 14 per cent. of patients had fever reactions above 100°F.
2. Inoculation indurations after first injection were present in 70 per cent.
3. Average duration of induration was forty-one days.
4. Abscesses occurred in 23 per cent.
5. Average duration of discharge from abscesses was twenty-three days.
6. Cough and expectoration showed no striking improvement.
7. Bacilli persistent in 85 per cent. of positive cases.
8. Appetite same, was less in some cases.
9. Vaccine patients lost more weight than others.
10. Chest pains improved in 20 per cent. Remainder were same or worse.
11. Patients had more fever and night-sweats after injection than before.
12. Blood-spitting was at least as frequent in vaccine treated cases as in others.

Writer's Results.

1. Less than 5 per cent. of patients had fever reactions above 100°F.
2. No inoculation indurations present after first injection.
3. No induration at all.
4. No abscesses.
5. No abscesses.
6. Cough and expectoration showed marked improvement.
7. Bacilli persistent in less than 80 per cent. of positive cases.
8. Appetite greatly improved in all cases.
9. All patients gained in weight.
10. Chest pains improved in 80 per cent.
11. Patients had less fever, were more often normal, and night-sweats disappeared in 90 per cent.
12. Blood-spitting was infrequent in all patients.

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| 13. No unusual tendency toward disappearance of physical signs, which were increased in many patients who were improving before. | 13. There was a marked tendency toward the disappearance of physical signs. |
| 14. 40 per cent. of 85 patients, whose present condition is known at an average of four months after first injection, are worse. | 14. Of these 50 cases, 90 per cent. are improved and 2 pulmonary cases are cured; 95 per cent. of the patients are working and earning a living. No patient shows increased activity of the disease. |

In addition to this—the writer's own experience over six months with 50 indiscriminate cases—Dr. Meyer, of Berlin, reports such excellent results as have led him to pronounce the Piorkowski tuberculin superior to all others; Dr. Klemperer, of Berlin, points to a large number of cases—60 per cent. of marked improvements; and Dr. Piorkowski, who developed the tuberculin, and the late Dr. Wm. J. Beattie, treated a great many cases with truly remarkable results.

While the writer is convinced from experience with the administration of the Piorkowski tuberculin that it is absolutely harmless, he does not claim that it is a specific cure for all cases of tuberculosis. He does assert that many cases will be improved by its use, and some absolutely cured, and he bespeaks for it a fair test by the profession at large.

418 Central Park West.

THE TREATMENT OF TUBERCULOSIS WITH A SOLUBLE VACCINE.

By J. O. HIRSCHFELDER, M. D., of San Francisco.

In an article published in 1912,* the writer described a method of obtaining a soluble vaccine of the various organisms by digestion with pancreatin for a short period. Since this publication, further experiments on animals and clinical observations have been made which have confirmed the statements in that article. It has been found that the action of the pancreatin is so gentle that the organisms have yielded up a portion of their end-body without losing their virulence, giving us the right to infer that the end-body is but slightly, if at all, altered in its chemical and physiological properties. It has been possible, both with the pneumococcic and the streptococcic extracts administered in daily increasing doses for a week, invariably to protect the immunized animals against a germ which always kills the control. 45 cases of pneumonia have been treated with the pneumococcic extract. Of these, 2 were moribund at the time of treatment, and of the others but 3 have died.

In the preparation of an extract of the tubercle bacillus, as published in the *California State Journal of Medicine*, July, 1913, it was found that pepsin produced a more potent extract than pancreatin and that ferment was consequently used. The extract of the living tubercular germ was filtered through a Berkefeld filter and was standardized by injection into tubercular guinea-pigs. 20 c.cm. of the properly prepared extract killed the guinea-pig within twenty-four hours with a strong reaction, shown by hemorrhages around the tubercular deposits in lung, liver and spleen. Of this extract 50 mgrm. were injected intramuscularly into tubercular patients, increasing the dose gradually up to 400 mgrm. daily, with markedly favorable results. As all cases that have passed beyond the very earliest stages suffer from the effects of secondary infection, it has become the rule in such cases to combine mixtures of the extracts of the pneumococcus and the streptococcus with it. As a rule no reaction has followed the use of these extracts, but occasionally a chill with rise of temperature and general malaise has set in, whereupon the dose has been diminished for a time without unpleasant symptoms and could later be increased without reaction. In the cases treated, a rapid amelioration of the symptoms with increased intervals of vigor has been observed, and x-ray plates taken at frequent intervals have shown a clearing of the lung. In some

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of the patients these changes in the *x*-ray plates have been very striking. In 2 cases in which the urine showed a strong diazo reaction, it entirely and permanently disappeared.

The most striking results were obtained in a case of lupus vulgaris of eighteen years' standing, which had resisted various forms of treatment. The patient received 50 mgrm. on August 31st, 1913, and increasing doses until she received 200 mgrm. at the fifth injection on September 4th, which was followed by a reaction. On the 6th she again received 200 mgrm. and again had a rise of temperature. No further treatment was applied as the ulcer had markedly improved, but progress rapidly followed so that by the beginning of October the trouble had passed away, and by December no sign of the previous trouble could be found.

The beneficial action of the soluble tubercular vaccine has been confirmed by other observers and further reports will be made at a future time.

275 Post St.

ETIOLOGY OF BONE AND JOINT TUBERCULOSIS.

By A. L. FISHER, M. D., of San Francisco, Cal.

When Koch discovered the tubercle bacillus and when it was first determined that certain bone lesions were due to this organism, an enormous advance was made in our knowledge of the nature of bone disease. A great advance was made, but at once it was evident that there remained much to be found out. And though much thought has been given the subject, and considerable experimental evidence accumulated, still we are far from knowing the exact reasons, anatomical, physiological, and chemical, that play a part in the etiology of bone tuberculosis. It is with the examination of these elements that this paper deals.

Tuberculosis of the bones and joints is set up by one agency and one agency only—namely, the tubercle bacillus. The tubercle bacilli get into the bones and joints in the only way possible—namely, through the blood-stream from some preexisting focus in the body. (Direct infection by wounds is possible, but must be extremely rare.) The blood flows through all parts of the bones; the tuberculous lesions are found in certain parts of the bones only. Why is it then that the bacilli pick out these certain spots? Is it something in the character of the circulation, or is it something in the nature of the tubercle bacilli themselves, or is it something in the nature of the structure of the bone, or is it something of an external, more or less accidental nature that determines why the lesions of tuberculosis are located in given parts of the bones? Satisfactory answers to these questions have not as yet been given. The lesions occur most frequently about the epiphyses of the long bones and in the flat bones—not in the shafts of the long bones. If it be true that there is some common factor in the character of the circulation, or in the structure of these bones that is sufficient to constitute the determining cause as to why the bacilli circulating in the blood should settle in these places,—then this factor must be examined critically from all points of view in order to see if it will stand the tests of criticism and experimentation.

The question of heredity of tuberculosis is not one that is distinctly connected with bone tuberculosis but with the disease in general, *i. e.*, whether there is any direct inheritance of the disease, or the inheritance of a tendency to the disease, etc. These questions do not belong to the subject of etiology of bone tuberculosis *per se*.

We find tuberculosis of the bone in individuals of all ages, but

apparently the disease is more frequent in childhood and adolescence than later, *i. e.*, we find actually more cases of bone tuberculosis beginning in the earlier years of life than later. Sir Watson Cheyne, however, points out that this relation is more apparent than real—that, if we consider the number of individuals alive at a given age and the number of cases of bone tuberculosis beginning at that same age, the proportion of cases to the number of people alive steadily increases.

Trauma.—One of the most disputed points in the question of the etiology of bone tuberculosis is the rôle played by trauma. Certain points are fairly well settled, *e. g.*, that gross trauma, such as fracture or dislocation, has no effect, for tuberculosis does not develop in bones that have suffered these injuries. The effects of slight, or of slight repeated trauma, are not so certain, or so easily accounted for. The frequency with which tuberculosis develops in and about individual joints varies with a fair degree of constancy, that is, in statistics gathered by several people the percentages of individual joints affected will be found fairly constant. Efforts have been made to account for this on the ground that the joints most frequently involved are those most exposed to trauma. Let us examine this and see if it is so. It is true that the bones and joints of the upper extremities are less frequently involved than those of the lower extremities and the spine. It is also true, in a way, that the upper extremity is less exposed to trauma than the lower, provided we consider the ordinary function (weight bearing) of the bones and joints in the lower extremity as a form of trauma. This idea loses considerable of its attractiveness, however, when we consider the individual joints of the lower extremity. We would be led to believe that the joint bearing the greatest weight, *i. e.*, the greatest strain, to be the one most affected. Is this so? The ankle bears the greatest portion of the body weight, then the knee, next the hip. This should be the order of the frequency of the involvement, but, as a matter of fact, the frequency is just reversed—the order being hip, knee, ankle. Of course, besides the trauma from weight bearing, injury from external violence of various sorts must be considered,—again it is hard to understand why the hip should suffer more than the knee or especially the wrist. Let us grant, for the instant, that trauma does play a part. What is it that the trauma actually does? how does it help the tubercle bacilli to settle and grow in a given spot? There are two general ideas, but no definite facts to bear them out. We say it offers a place of lessened resistance, but when we analyze this phrase it simply means that we use words without connecting definite ideas to them. When we traumatize a part, what do we do? We may produce a hemorrhage, with or without formation of a blood-clot. We may definitely injure the cells making up that part, and we may interfere with or destroy its nerve- and blood-supply. In bone it is inconceivable that the

slight trauma to which tuberculosis is usually ascribed could possibly interfere with the nerve-supply or destroy cells to any great extent. The two ideas usually held are that it produces a blood-clot or a slowing of the circulation. How does the blood-clot and the slow circulation favor tubercle formation? Does the blood-clot offer a favorable point for the tubercle bacillus to settle and grow upon? This in itself is an unsettled point. If it is true that the circulation in a given part is slowed by injury, it is much more readily understood how the organism can get a start, for the slowed blood-current would allow the organisms to pass readily enough from the blood through the wall and into the tissues where they could grow.

Krause injected tubercle bacilli into the blood of animals and then subjected certain joints to trauma and found that tuberculosis developed in such joints while uninjured ones did not develop tuberculosis. Others have not been able to repeat this work with similar results.

Apparently cured tuberculosis often lights up after an injury. This is often one of the strongest points in favor of the effect of trauma as a determining factor. In these cases the sequence of events is such that there is little room to doubt that the relationship is that of cause and effect—the trauma representing the cause; the lighting up of the disease process, the effect.

Lexer says the reason that tuberculosis starts where it does in bones is on account of the presence of end-arteries; that an embolus of tubercle bacilli gets caught in the small arteries and the tubercle bacilli then grow and multiply and set up tuberculosis. He states that the area or areas of tuberculosis in bones are in general the shape of an ordinary infarct, *i. e.*, wedge-shaped. He also pictures end-arteries in bones, especially in young developing bones. But a great many cases of tuberculosis develop in the adult bones where end-arteries are absent or at most infrequent. Further, the general shape of many foci of tuberculosis is not that of an infarct, and it seems strange that pyogenic foci should not take the same form and pick out the same locations in bone that tuberculous foci do, if it were merely a question of end-arteries. Surely, pyogenic infection of bone, like tuberculosis, arises as a secondary infection, *i. e.*, from some focus elsewhere in the body, and the organisms are carried to the part in the blood-stream.

Again in many places where definite end-arteries exist, tuberculosis is an extremely rare affection, as for example in the brain.

Recently Ely has advanced the idea that there is something different from the anatomy of the blood-vessels or from injury that is the determining factor in the development of bone tuberculosis. He points out that it is a question of red marrow as distinct from yellow marrow; that red marrow is a lymphoid structure; that all lymphoid structures are attacked by tuberculosis; that in the lym-

phoid tissue the tubercle bacillus finds food on which it can flourish and its general living conditions good. He points out that in those locations (about the epiphyses of long bones and in the flat bones, etc.) where tuberculosis arises in bone we find red marrow, and where tuberculosis does not arise, there yellow marrow is present. However, if a secondary infection takes place, then the tuberculous process will be present in the yellow marrow too. He maintains that in the yellow marrow the tubercle bacilli alone cannot survive, but in company with the pyogenic organisms and the products of their metabolism the tubercle bacillus finds a good medium for its growth. This theory is more or less attractive. By means of it many of the facts in connection with the pathology and treatment of the disease can be explained, but these subjects do not concern us here.

It is true that lymphoid structures are attacked with great frequency by the tubercle bacilli as evidenced by the tonsils, the lymphoid tissue in the intestines, the bronchial lymph-nodes, the spleen, etc. Again, it is not true that these are the only structures attacked, as evidenced by the skin and adrenal gland. The synovial membrane is in reality a lymphoid structure; hence the disease may be found to be primary in the synovial membrane. This idea that the cause of the disease lies in a chemical attraction between the tubercle bacillus and the lymphoid tissue is attractive, but there are certain objections to it. First, other tissues are attacked by the tubercle bacillus, for example, skin and adrenal; and secondly, there is a rather constant relation in the occurrence of tuberculosis of the two sexes. Early in life (roughly before ten years) the proportion of cases occurring in girls and boys is about the same. After this there is a constantly increasing proportion of males. The advocates of the trauma theory use this as one of their strong arguments. In early childhood boys and girls are about equally exposed to trauma—later the males are exposed to trauma with much greater frequency than the females, and it is certainly a difficult argument to meet in the present state of our knowledge. We do not know of any essential difference in the marrow in males and females, although further investigation may show this to exist.

To sum up the matter, one may say that though we know that the tubercle bacillus causes the lesions in bone and joint tuberculosis, we do not as yet know the factors that operate to cause the organism to settle in the particular places that it picks out. We do know that there are points of preference, but what the real reason for the preference is can only be brought to light by further careful study.

BISMUTH PASTE IN SURGICAL TUBERCULOSIS.

By CARL BECK, M. D., of Chicago.

A recent article on the treatment of tuberculous fistula in *Le Monde Médicale* by Calot, of Berck, begins with the words, "Aux tuberculoses fermées la guérison est sûre, la fistule est une porte ouverte à la mort," which, when translated, reads: "Closed tuberculosis can positively be cured, the fistula is an open door for death." This metaphor is exaggerated, but contains a great deal of truth. *Fistulæ* still remain the most dreaded conditions brought about by the tuberculosis process.

There is no doubt that the treatment of tuberculosis has made great progress during the last few years. Owing to the general interest of the public, the munificence of philanthropists and wise governments, the White Plague is being fought everywhere, with the result that it is becoming more scarce, less dreaded, and more tolerable.

Surgery has taken its part in the battle ever since tuberculosis has been attacked by treatment. At first the piqure, the hot iron, then the cautery, then the sharp spoon (curette), and then the surgical operations became the means of treatment. With the advance of aseptic surgery beautiful results were obtained by the surgeon in the treatment of tuberculosis; in fact, some conditions, like bone, gland, and kidney tuberculosis, have been entirely relegated to the knife. But, the careful observation of the history of these movements must clearly show the fact that gradually the pendulum begins to swing backward toward conservative or non-bloody treatment. In the course of years it has been shown that the ultimate results of the different surgical, extensive and repeated operations of tubercular lesions have been less successful than those of the non-operative treatment.

It is the object of these few lines to call attention to one of the methods which the author has introduced into surgery, and which has been successfully carried out, and been written of in a large number of articles, by his brothers, Dr. Emil G. Beck and Dr. Joseph C. Beck—namely, the bismuth paste treatment.

It is now eight years since it was introduced, and since then has been employed by us in many hundreds of cases and also extensively by many other surgeons; hence a review of what benefit it possesses would not be inopportune.

It is simple, and can be applied by anyone with a slight degree of skill, and therefore may easily become a favorite treatment. It

requires very little apparatus and hardly any preparation. But, it is not always successful in the hands of everyone, and many times I have seen cases terminate successfully in the hands of my brother which had failed to respond to the treatment in the hands of others. The reports of other surgeons have been very enthusiastic and quite flattering in most instances, but some have had no success with it. It has been modified by some and then proved successful, and many explanations have been made. The fact remains that my brother Emil G. Beck, who has been particularly interested in this line of treatment, has been able to show a large percentage of cures even of desperate cases, some of which had had a dozen and more unsuccessful operations. What is the cause of this disparity? On one side is the fact that in our clinic the most careful technique is employed by an expert, the most rigid control by *x-ray* pictures is maintained, and there is the utilization of other means of additional treatment, as sun, air, hygiene, etc.; while on the other, failures reported by other surgeons most often were cases which had been treated by some junior assistant, or by a nurse, and without the control of *x-ray* pictures and without accurate knowledge of the technique. Naturally there must be better results at the hands of experts. Proof of this may be found in the fact that from a clinic such as that of Prof. Eiselsberg, of Vienna, who personally visited our clinic and studied some of the cases with great interest, the reports of successful results have been very gratifying.

Calot, after reviewing the whole field of activity in the treatment of the fistula, exclaims: "In the matter of physiotherapy, what has not been brought forward,—Bier's method, the *x-ray*, sun cures, ultra-violet rays, radium, all sorts of baths at all the mineral water and thermal stations in the world. Assuredly, I believe in these various measures, but, I must add, that however beneficial they may be in superficial fistulæ, they can have but little effect, or none at all, in deep-seated fistulæ (as in coxalgia or Potts' disease) where, at the most, they may exert a favorable influence on the general health. As for me, after unlimited experience of every kind of treatment for tuberculous fistulæ, *I may state that the best method is by means of medicated pastes.*"

Calot claims to have used medicated pastes before I introduced mine, but at least I have never heard of them. Nevertheless, I think that he is correct in the statement that this method is the best for certain cases. There is no doubt that good results may be obtained by injection of camphorated phenol, naphthol, guaiacoli-iodoform, but the bismuth is more simple and can be applied more easily.

There is very little to say about the technique. A plain glass syringe and a mixture of 30 per cent. bismuth vaseline heated over water are all that is necessary (Fig. 1). But, it is more important to know where the mixture goes after it is injected, what spaces

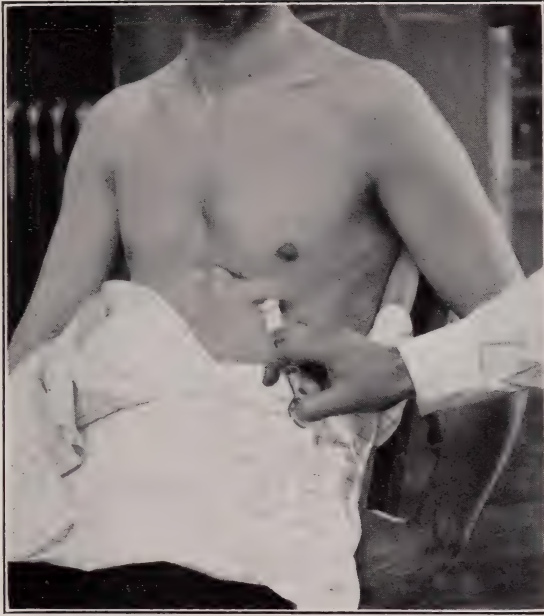


Fig. 1.—Technique of method.



Fig. 2.—Showing a good functional result in an extensive knee tuberculosis.



Fig. 3.—Same case in different position.

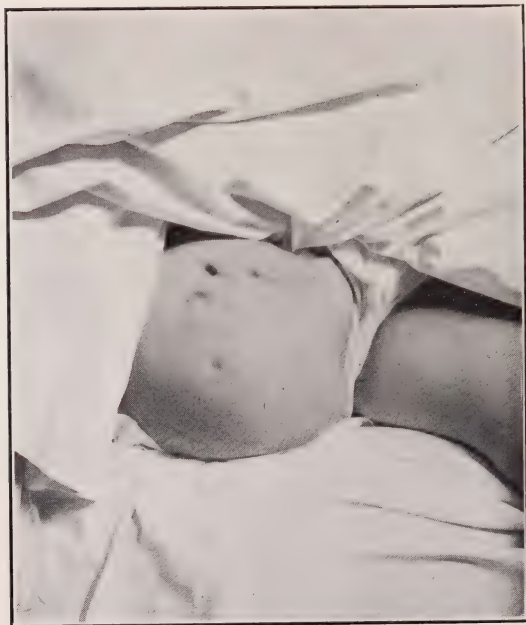


Fig. 4.—Very extensive hip-joint tuberculosis permanently healed by the method.

it fills and does not fill. The taking of stereoscopic pictures is essential in order to enable one to see the ramifications of the sinuses, the origin of the process, and the cause of the fistula. In many cases a single injection has sufficed to stop the flow of pus permanently, there being no recurrence. Often it is necessary to evacuate the mixture to avoid absorption.

Space does not permit my going into details, but it may be said in this résumé that after eight years' observation and use, the author and his associates look upon this method as one of the most useful in the treatment of sinuses, one which has given us the most gratifying results in numbers of cases in which no other known method would bring about the desired results; and further the results obtained by us have been permanent.

Just a few words with regard to the dreaded bismuth poisoning, which has been held up as a danger signal to everyone employing the method. With careful use of the method one can avoid this danger. In our own clinic we have never had a case of bismuth poisoning. We have seen absorption, symptoms on gums, and sometimes even light kidney irritation, but we have been able to cope with such conditions successfully, avoiding fatalities. Like every good method, it has its dangers, and particularly in the hands of the unskilled or careless person.

RADIOGRAPHY IN THE DIAGNOSIS OF PULMONARY TUBERCULOSIS.

By A. B. MOORE, M. D., of Rochester, Minn.,
Mayo Clinic.

In the examination of the thorax, as in the examination of other structures, the radiograph can be but one link in the chain of diagnostic evidence and its value depends on the care in technique and the conservatism in interpretation.

To Albers-Schöenberg, Wolff and other observers abroad, and to Dunham, Lange, Hickey and others in this country, belongs the credit of establishing the value of the Roentgen rays to the clinician in the diagnosis of pulmonary tuberculosis. In the early days of radiography, because of the difficulty of obtaining a sufficient exposure in the short time that the thorax was at rest, the lack of suitable apparatus made the radiographing of the adult chest almost an impossibility. The more powerful modern type of machinery, the increased speed of the sensitive plate and the improvement in technique have overcome this difficulty. Perhaps the greatest aid to radiography of the lungs was the introduction of the stereograph. By this method we are able to visualize the intrathoracic viscera in their true anatomical relationship and to determine on what plane the structures showing varying degrees of density are situated.

The thorax has been called the playground of the radiographer, for in no other location are there such opportunities for radiography. The radiograph is a shadow-picture and the structures and organs of the thorax are ideally shown by it. Here we see a large bony cage containing structures that vary in density from the non-resistant air-passages to the dense heart.

The technique that is used in the Mayo Clinic is very simple and differs but little from that described by Dunham and others. It consists in making a pair of stereoscopic plates with the patient in the upright posture facing the plate and the tube shifted parallel to the spine. The upright posture is preferred because it is more easily assumed by the patient. It also permits of more perfect relaxation and rest of the thorax and does not distort the relationship of the intrathoracic viscera. Owing to the greater density of the posterior portion of the ribs over the anterior, it is best to have that portion at the greater distance from the plate. Therefore, the plate is placed in front of the patient.

No radiographic examination of the lungs should be based on the

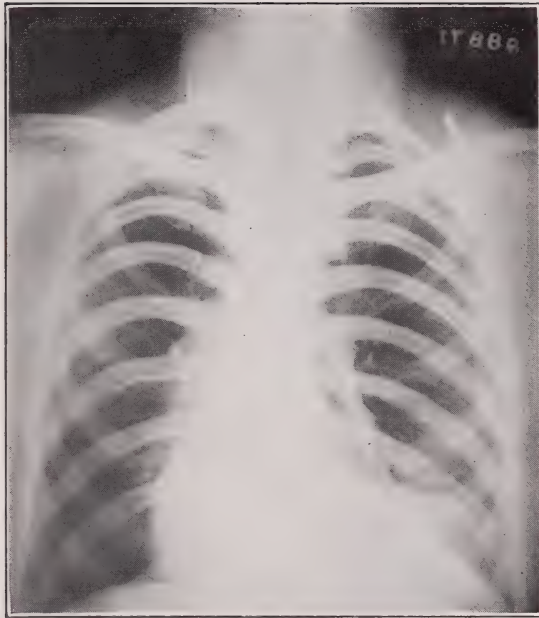


Fig. 1.—Chronic bronchitis. Note the increase in the hilus shadow and thickening of the peribronchial tissues.

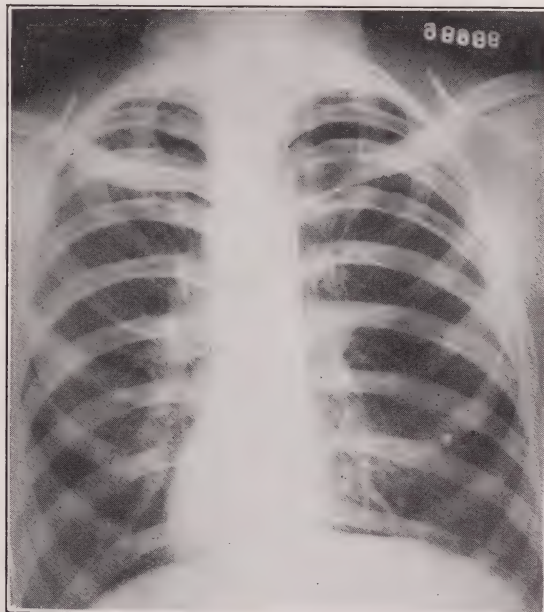


Fig. 2.—Early tuberculosis of the left apex. Note the areas of increased density just above the left clavicle.

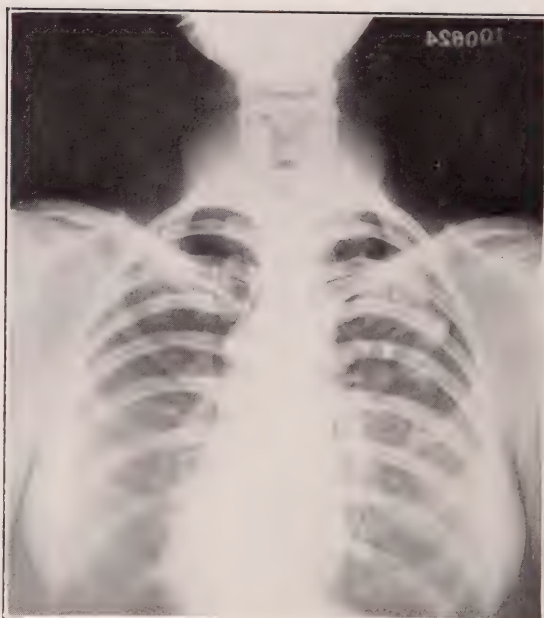


Fig. 3.—Diffuse tuberculosis of the upper and middle right lobes. Early involvement in the upper left lobe.

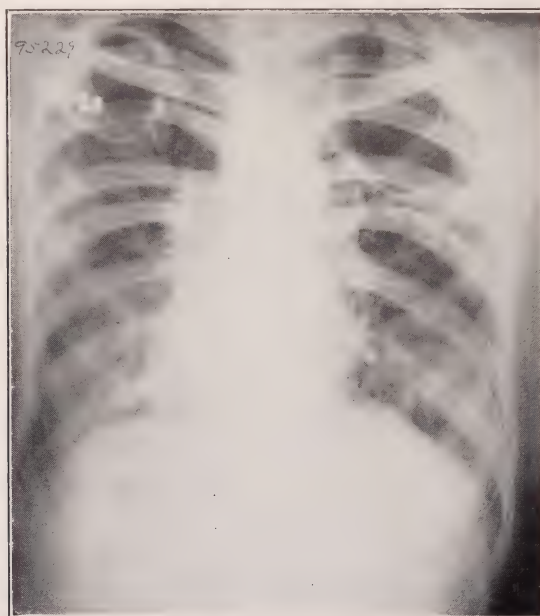


Fig. 4.—Old diffuse tuberculosis involving both lungs. Note the large healed cavity in the upper left lobe and a well-marked pleuritic adhesion in the upper right lobe.

study of a single plate, since it is impossible in this way to localize a lesion. Hence in our clinic the examinations are made routinely by the stereoscopic method. The time required for making a satisfactory pair of stereographs should not be more than five seconds, preferably less in order to minimize the distortion due to movement of the heart.

In the interpretation of the radiograph, we should carefully examine every detail that it contains and always remember that we are considering shadows, not objects. The radiograph of a normal thorax shows the ribs, clavicles, and scapula on either side, forming the bony wall above the cervical spine and below the dome of the diaphragm arching across from side to side. In the centre is the dense shadow of the heart and mediastinum and radiating outward on either side from this is the shadow of the hilus composed of the main bronchi and the large blood-vessels. Under ideal conditions, these may be traced into five main divisions, three on the right and two on the left, corresponding roughly to the five lobes of the lungs.

In any pathological condition in which there is a persistent increase in the blood-supply of any portion of the lungs with consequent thickening and formation of fibrous tissue, areas of increased density are found in the radiograph.

From the evidence of these areas of increased density, the radiographic conclusions are drawn. In inflammatory conditions affecting the main bronchi, a marked increase in density of the shadow of the hilus is found. If the inflammation spreads to the smaller bronchi, an increased density and fibrillation is found which extends outward towards the periphery of the chest and, if consolidation takes place, definite areas of increased density are present. In examining the tuberculous chest the shadow of the hilus is increased in direct proportion to the extent of the involvement of the main bronchi, and the size of the areas of increased density correspond to the amount of consolidation, while they vary in degree with the stage of the disease. Early pulmonary tuberculosis gives but a faint shadow. As the process advances, the density becomes greater and, as it continues further, a cavity may form which appears in the radiograph as a clear circumscribed area of diminished density with a dense wall. If the process is arrested and nature heals the lungs by the formation of dense scar-tissue with deposition of the lime salts, there is a still greater increase in density. It is very difficult and often impossible to distinguish by the radiograph a healed lesion from an active one. In every case of pulmonary tuberculosis there is a more or less distinctly increased density of the hilus shadow, but this same increase exists in all infectious and congestive conditions of the bronchi and lungs, hence it is of no value in determining the presence of a tuberculous lesion in the lungs. In the radiograph of practically every adult chest,

we find shadows of calcified glands around the larger bronchi, but it rests with the pathologist to determine whether they are due to tubercle bacilli or to some other irritant.

In every case of pulmonary tuberculosis, there is a certain degree of peribronchial thickening; however, an extensive simple bronchitis gives the same radiographic picture and we are unable thus to differentiate a tuberculous from any other form of bronchitis. Since tuberculous bronchitis without pulmonary involvement is very rare in adults, we are not often confronted by this condition. In children, however, a peribronchial thickening in the absence of other causes should be regarded as very suspicious of tuberculosis.

From the standpoint of the radiographer, the diagnosis of pulmonary tuberculosis depends, the writer believes, on the localization of definite areas of increased density varying in size and degree with the stage of the disease. Of the conditions other than tuberculosis that are characterized by increased density and from which it must be differentiated, those most commonly encountered are metastatic carcinoma and syphilis. In carcinoma of the lungs, the areas of consolidation are more clearly circumscribed, are more massive in size, are located at the base rather than at the apex, and exhibit no tendency to cavity formation. In syphilis of the lungs, the appearance is not characteristic radiographically but is usually accompanied by a much greater thickening of the hilus than is present in tuberculosis.

This report is based on the combined clinical and radiographic findings in a series of 1,000 cases of pulmonary tuberculosis which have been examined at the Mayo Clinic during the past three years. The clinical and radiographic examinations were conducted separately, neither clinician nor radiographer having any knowledge of the findings of the other. From the radiographic standpoint, the cases were classified as early, diffuse, miliary and healed.

Early.—Twenty-four per cent. of the cases were classified as early, there being less than one lobe involved and the lesion appearing active. In 35 per cent. of these cases the lesion was situated on the right side, in 33 per cent. on the left, and in 32 per cent. both sides were involved. Clinically, 80 per cent. of these cases had an afternoon rise in temperature, and 40 per cent. of them had tubercle bacilli in their sputum.

Diffuse.—In 64 per cent. of the cases in the series more than one lobe was involved. 80 per cent. of these cases showed tubercle bacilli in the sputum, and 90 per cent. of them showed the presence of fever. The involvement was confined to the right lung in 13 per cent., to the left lung in 9 per cent., while both lungs were involved in 78 per cent. 41 per cent. of these cases of diffuse tuberculosis showed the presence of cavities. Of these, 42 per cent. were situated in the right lung, 39 per cent. in the left, while 19 per

cent. had cavities in both lungs. In 60 per cent. of the cases the cavities were single and in 40 per cent. multiple.

Healed.—Eleven per cent. of the cases in the series were classified as healed, the lesions appearing sufficiently dense in the radiograph to indicate that they had ceased to be active. 13 per cent. of these cases showed lesions in the right lung, 24 per cent. in the left lung, while 63 per cent. showed lesions in both lungs. In 28 per cent. of these cases fever was present, and in 15 per cent. the sputum showed tubercle bacilli.

Miliary.—This series consisted of but 1 per cent. of the cases examined, all of which showed the presence of fever and none of which showed tubercle bacilli in the sputum.

CONCLUSIONS.

From a study of the foregoing cases the following conclusions may be drawn:—

1. The gross lesions of pulmonary tuberculosis give a characteristic appearance in the radiograph.

2. The diagnosis of pulmonary tuberculosis by the radiograph must be based on the localization of definite areas of increased density.

3. In the vast majority of cases the radiograph will demonstrate any lesion that the physical examination will reveal.

4. The radiograph will demonstrate much more accurately the extent of involvement than any other diagnostic agent.

5. In determining the operability of a surgical condition in a patient suffering also with pulmonary tuberculosis or in giving a prognosis in a known case of pulmonary tuberculosis, the radiographic examination is essential.

6. In border-line cases the Roentgen ray cannot determine the activity of a tuberculous process.

7. No conclusions can be drawn from the shadow of the hilus in the adult.

8. Malpositions and distortions of the shadows of the diaphragm or heart are rare except in cases of pulmonary tuberculosis of long standing, and little or no significance should be attached to them.

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TUBERCLE BACILLI IN SPUTUM OF ACUTE COLDS; WITH DISAPPEARANCE OF BACILLI DURING CONVALESCENCE.

By L. NAPOLEON BOSTON, A. M., M. D., of Philadelphia,
Professor of Physical Diagnosis, Medico-Chirurgical College; Physician to the
Philadelphia General Hospital; Pathologist to Frankford Hospital.

My attention was first called to this particular subject in 1898 when there were admitted to the wards of the Philadelphia General Hospital, within a comparatively short period, two patients, females, in both of whom the diagnosis was that of influenza. I was at that time especially interested in the bacteriology of influenza, and during such investigation found that upon the second day after their admission, the fourth day of their illness, both showed tubercle bacilli in the sputum. Repeated examinations of the sputum were made later, but at no time was I again able to detect tubercle bacilli. One of these patients remained in the hospital for nearly one year, and never during that time did she show any evidence of pulmonary or other forms of tuberculosis. The other case remained under observation for a period of about seven weeks and left the hospital enjoying health.

Stimulated by the results of the findings in these two cases, I have since continued examining the sputum both of private and hospital patients suffering from acute colds, and from influenza. I have not kept records of the number of sputa examined in this particular class of cases, but am sure it extends well into the hundreds. It has been my privilege to discover cases showing tubercle bacilli, periodically, during each year's work. At no time have I found a number of this variety of cases to appear in epidemic form, but on the contrary, they were always detected singly, and during the study of a large number of cases of acute colds.

During the years 1910, 1911, 1912 and 1913 there appeared, both in my private practice and in hospital service, 14 cases of acute colds, where the sputum for one or more examinations showed a variable number of tubercle bacilli. Practically speaking all these cases were treated with reference to allaying the associated bronchitis that formed a fairly conspicuous clinical feature in the case in question. In every instance a careful physical examination of the chest failed to disclose positive evidence of a pulmonary lesion, although the signs of acute bronchitis were more or less well marked in each case. In 5 of the cases it was possible to have an x-ray study of the lung, and in three instances this line of study gave evidence of pulmonary involvement.

One of the cases studied in 1910 was that of a physician, who first consulted me while suffering from what he regarded as an attack of influenza. I found great numbers of tubercle bacilli in the sputum, each field containing from three to ten bacilli. This patient gave a history of having never suffered from any form of pulmonary disease and did not recall being ill since a child. Tubercle bacilli were present in the sputum over a period of five days. This patient has suffered no serious inconvenience since the illness referred to, although he has used every precaution against undue exposure, and other conditions that might lead to an acute cold. He has also been careful as to his diet and through forced feeding has gained 25 lb. in weight. The sputum has been examined at repeated intervals since 1910 and has been approximately normal at each examination. In this case the *x*-ray gave questionable evidence of involvement at the left apex. The second *x*-ray study made in 1913 showed no change in the pulmonary condition.

In January, 1913, I was called to attend a young female, married, aged twenty-seven, who gave a history of having contracted an acute cold two days prior to my visit. The sputum was not free and in fact it was with difficulty that we were able to collect sufficient for examination. Sputum studied three days after the beginning of this attack showed the presence of tubercle bacilli. The sputum was studied daily in this case for a period of fifteen days. Tubercle bacilli were found present in but three of the fifteen examinations. All symptoms of the acute attack subsided within a period of approximately twenty days, and examinations have been made every month since the original attack, and at no time have tubercle bacilli been demonstrated in the sputum. An *x*-ray study of this patient showed a questionable involvement of the right apex. A second *x*-ray made September, 1913, gave unmistakable evidence of involvement of the same area of the right lung. This patient has enjoyed health since her original attack (January, 1913) and through forced feeding has gained 10 lb. in weight.

Appearance of the Sputum.—In my experience the sputum (found to contain tubercle bacilli) collected from patients suffering from acute colds has not been in any way characteristic. Certain of the cases were not accompanied by free expectoration; and I recall several where it was with difficulty that the patient was able to collect sufficient sputum for examination. In fully one-half of all the cases the patient experienced a rather severe attack of coughing upon rising after a night's sleep; and this cough was often accompanied by a moderate amount of expectoration.

Many of the cases showed a greater tendency toward violent irritation of the nasal mucous membrane than they did of the bronchial tract. In six instances the sputum was slightly tinged with blood. In selected cases the sputum was clear, while in a few it was thick and tenacious; this latter feature being most conspicuous

when the sputum was collected at the morning coughing, and after a night's sleep. Five of the cases gave a copious expectoration for nearly one week, but in the vast majority of instances the degree of expectoration was at first scanty, later moderately increased, and finally free; this entire cycle occupying from two to four days.

The foregoing remarks are applicable only to cases of acute colds that have come under the writer's observation, where tubercle bacilli have disappeared from the sputum in a comparatively short time following the initial symptoms of the cold. True it is, that a large percentage of tuberculosis begins in this way, and I have excluded from this collection all cases that have not remained in health for a period of at least one year following the initial acute cold, during which time tubercle bacilli were present in the sputum. The number of tubercle bacilli found in the sputum of acute colds varies so greatly that in my opinion it is scarcely worth consideration. Many of the cases that showed great numbers of bacilli to be present, made not only rapid but apparently permanent recoveries. I recall one instance, that of a female, where in all I made twenty-four examinations of the sputum. The first during the acute cold showed a great number of tubercle bacilli, and the other twenty-three gave negative results.

EARLY DIAGNOSIS IN TUBERCULOSIS OF THE NERVOUS SYSTEM.

By CHARLES GILBERT CHADDOCK, M. D., of St. Louis.

The central nervous system is frequently invaded by tubercle bacilli; often secondarily, sometimes seemingly primarily. This may occur at almost any age, but it is more frequent in infancy and the earlier years of life. Tuberculosis of the central nervous system may exist without clinically demonstrable tuberculous lesions in other organs, and clinically primary nervous tuberculosis is found most frequently in infancy or early childhood. Secondary tuberculous involvement of the central nervous system occurs alike in the young and in adults.

The principal forms of nervous tuberculosis are (1) the diffuse, (2) the multiple circumscribed, (3) the isolated circumscribed.

The favorite seats of the pathological process caused in the nervous system by tubercle bacilli are the meninges with their blood-vessels and the intimate coverings of cerebral and spinal nerve-roots. The arachnoid and pia suffer much more frequently and intensely than does the dura. The leptomeninges of the brain at the base are the seat of most extensive involvement as a rule, but in such cases there is usually a similar, but more discrete, invasion of the arachnoid and pia of the cervical and dorsal levels of the spinal cord, and here there is found a notable predilection for implication of the posterior aspects of the spinal axis. Occasionally the spinal structures are those most intensely involved. In most cases of diffuse tuberculous disease of the nervous system, the findings are those of a cerebrospinal meningitis; the nervous structures are secondarily affected by loss of blood-supply, by cellular invasion, by pressure of inflammatory products, leading to their partial alteration or complete destruction in foci or in systematic degenerations in brain and cord. Tuberculous meningitis may be discretely localized. Circumscribed tuberculo-nervous lesions take the form of tubercles. These may be multiple, but they are often single, especially in the spinal cord, where their seat of predilection is the gray matter. A single intraspinal tubercle is frequently associated with tubercles in the brain. Tubercles found in the substance of the nervous system arise probably from the blood-vessels; those that are extramedullary, extracerebral, etc., arise from the membranes, and involve the nerve-structures by pressure.

Tubercles vary in size from that of a minute granule to that of an egg. In early years they are by far the most frequent form of

intracranial growth; they are found even in the earliest month of life. In infancy there is a marked preponderance in frequency of cerebellar and pontine tubercles over those seated elsewhere.

In statistical tables of tumors affecting the spinal cord, tubercles follow sarcomata in frequency, and they are found to be almost always intradural, and solitary in 80 per cent. of the cases. As intramedullary tumors, tubercles are less frequently found than gliomata, but they are more frequent than such tumors of syphilitic origin.

Tuberculosis of its bony coverings, especially of the vertebræ, is a frequent cause of disease of the central nervous system. Pulmonary and other forms of chronic tuberculosis may so lower general nutrition that the central nervous system, especially the spinal cord, suffers to a degree that induces focal and systematic nerve-degenerations.

Tubercles, like neoplasms, are of slow development, and therefore their symptomatic manifestations appear gradually, as a rule. But tumors at times may, by reason of peculiar location or of adaptation of nerve-tissue to pressure, or for unknown causes, attain large size before causing symptoms, and then their origin appears to be sudden or rapid.

The various forms of tuberculous meningitis are peculiar in that they are subacute and protracted in their course, save in very rare instances. Fever here is slight or wanting; all other forms of meningitis show active febrile movement either continuously or at some time in their course.

The means at our disposal for the diagnosis of a tuberculous infection have been greatly increased in recent years—direct demonstration that the organism harbors tubercle bacilli. Examination of the cerebrospinal fluid is often an invaluable aid to knowledge of the condition of the cerebrospinal meninges. The finding of tubercle bacilli in this fluid demonstrates the nature of a suspected or evident meningeal disease. But here, as in pulmonary tuberculosis, this material evidence may at times, or for a time, fail; and we may thus be forced to rely upon the other and less dependable diagnostic data.

The help neurology can give the general diagnostician in tuberculosis of the nervous system is pathologically indirect, but it is, nevertheless, of capital importance from the point of view of topical diagnosis.

Since, in general, tuberculous invasion of the central nervous system is gradual, and induces general and well-recognized nervous symptoms only tardily,—nervous symptoms that are recognized as such, as it were, offhand,—we may legitimately ask, Are there special early signs and symptoms, which, if recognized, tell that the nerve-structures are involved, and warn of the possible ultimate development of active and obvious symptoms of central nervous disease?

This question may be confidently answered in the affirmative. To explain the significance of this statement, we have only to consider what is found in some cases of nephritis due to scarlet fever in children; here it has been noted that Babinski's extensor toe-phenomenon has developed some time before the occurrence of uremic convulsions; and in such cases its presence may be regarded as a warning and an urgent indication for prophylactic measures of treatment. It is well known that the Babinski sign is found usually after epileptoid seizures, and that it may be absent in intervals between such attacks. In such cases the fits do not cause the toe-phenomenon, but it and the fits are due to an abnormal physical or dynamic condition of the brain; and it is certain that the toe-sign may be found to have developed before epileptoid seizures, to persist for a time after them, and then disappear.

These facts justify an attempt to show the value of certain nervous signs and symptoms as early indices of organic disease of the nervous system, when they are found singly or associated in any case, without the more commonly appreciated symptoms of disturbance of the central nervous system—headache, spasms, convulsions, vomiting, vertigo, incoordinations, tremors, delirium, disturbances of consciousness, paralyses, etc.

In the order of acknowledged importance, Babinski's toe-phenomenon deserves first place. It consists of extension of the great toe, with or without extension and fanning (separation) of the small toes, when the plantar surface of the foot is irritated. Separation of the toes like the opening of the ribs of a fan, so caused, has the same diagnostic value as the classic extensor movement of the great toe. It localizes the disturbance in the related pyramidal tract, but it does not tell the level nor indicate the nature of the trouble. It was long and justly regarded as the earliest and most delicate known evidence of organic disease of the pyramidal tract. Since its discovery it has been taught that this toe-sign occurs as a normal manifestation in the newborn, and in the child until myelinization of the pyramidal tracts had been fully accomplished. Thus this valuable diagnostic aid has been regarded as failing us in cases of central nervous disease in infancy. I am convinced that this is an error of observation. Many, many times have I sought to find Babinski's sign in the early weeks and months of the life of normal infants, and never have I found it; on the contrary, I have always in such cases seen very active plantar flexion of the toes. There is perhaps reason for this error to be found in the active movements of escape excited by painful stimuli applied to the sole of an infant. My view on this point is held by several of my co-workers in hospital practice. I therefore believe that the Babinski phenomenon observed in an infant or child should be given the value which the same sign is given when found in the

adult. If my convictions prove to be valid, a very important addition will be made to our means of pediatric diagnosis, and especially in such an insidious condition as tuberculosis of the infantile nervous system.

Concerning the sign of Oppenheim,* which in the adult has a diagnostic meaning like that of Babinski's sign, I am not able to speak with the same precision. It is not generally regarded as occurring in normal infancy. The same may be said of Gordon's sign. The former consists of extensor response of the toes when pressure by a stroke downward, as with the handle of a percussion hammer, is made along the inner border of the tibia; the latter consists of the same reaction where the deep muscles of the calf are pressed upon by the examiner's fingers.

Trœmner's sign, and that of Redlich, are actually Gordon's sign, only induced with slight variations of procedure. If the signs of Gordon, Oppenheim, Trœmner, etc., which so often occur in association with the Babinski phenomenon and are due to a like cause, are not regularly found in infancy, we have an additional reason for holding the accepted view of the Babinski sign as a normal phenomenon in infancy to be erroneous.

The external malleolar sign** is likewise indicative of disturbance in the related corticospinal motor path. It consists of an extensor-fanning movement of all or several of the toes on irritation or pressure of the skin area in the depression that outlines the external malleolus. Firm pressure in the groove behind and around the end of the external malleolus, either exerted by the finger or a blunt rubber eraser, often suffices to induce this sign; or a blunt-pointed hard instrument (a nail-file, a pointed stick of orange-wood) may be used. In the vast majority of cases in which Babinski's sign can be induced from the sole, this sign can be brought out from the external malleolar skin area indicated. However, the external ankle-sign is sometimes wanting in the presence of Babinski's toe-sign. On the other hand, the ankle-sign is very frequently present when the greatest care in effort fails to elicit the phenomenon of Babinski. Prolonged study of this sign, as found in a great variety and number of cases of organic nervous disease, has led to the conclusion that in a majority of such cases it is an earlier and more delicate indication of disturbance of the function of the pyramidal tract than any of the other signs thus far mentioned here. This conclusion seems justified by consideration of certain circumstances under which it has been observed to appear

*Babinski (*Travaux Scientifiques*, p. 50. Masson et Cie., Paris, 1913) considers the sign of Oppenheim as a modality of the toe-phenomenon. Yoshimura regards that of Gordon (by implication) in the same light (quoted by Babinski).

**Chaddock: A New Diagnostic Nervous Sign. (*Interstate Med. Journ.*, Vol. XVIII, No. 7, 1911). Explanation of the External Malleolar Sign. (*Journ. Missouri State Med. Assoc.*, October, 1911; *Interstate Med. Journ.*, Vol. XVIII, No. 10, 1911.)

and disappear; and by reason of certain associations in which it is almost if not quite invariably found. In many cases of cerebral trauma it has been found before Babinski's sign could be elicited, but in which the latter ultimately developed; and in these cases, after operative interference, it was found after Babinski's phenomenon had disappeared, finally disappearing in turn.

The associations of the external malleolar sign seem to offer striking proof of its diagnostic value as well as of its delicacy of indication.

The first association noted was with Babinski's sign in the same limb; indeed, it was regarded as merely a variant of that sign until its variation of association in *time* was proved. It was next found to be present from the very first in cases of apoplexy due to capsular lesion, *not only on the paralyzed side, but also on the unparalyzed side*, and on this side with no indication whatever of Babinski's sign. When in these cases, the hemiplegic state had become permanently established, the same association persisted, sometimes with continuance of Babinski's sign and the ankle-sign on the paralyzed side, sometimes with disappearance of the ankle-sign and continuance of Babinski's sign on the paralyzed side, *but always with continuance of the ankle-sign on the unparalyzed side*.

The next association noted was one with a sign elicited at the wrist,* which had not been previously described or at least evaluated.

Normally, in most persons, pressure on or scratching of the skin of the wrist at the border of the palm along the ulnar border of the tendon of the palmaris longus, causes slight dimpling of the external surface of the hypothenar eminence. It was found that when an isolated ankle-sign was present on one side, very frequently irritation of the skin of the wrist, in the manner just indicated, caused active flexion of the wrist, some extension of the fingers, and approximation of the thenar and hypothenar eminences, especially by adduction of the base of the thumb. Observations soon showed that in these circumstances this association of ankle- and wrist-signs indicated a disturbance of the related pyramidal tract at some level above the cervical enlargement, usually intracranial. In cases of paresis, this association of wrist- and ankle-signs was often found to be bilateral, while no other abnormal cutaneous reflex movement could be induced. Study of hemiplegics next showed a constant bilateral association of plantar, ankle, and wrist movements. On the hemiplegic side was found Babinski's sign, with—sometimes without—ankle-sign, and *absence* of any sign at the wrist on that side; on the opposite (unparalyzed) side, the ankle-sign was always found associated with a wrist-sign in the sound arm. Thus the bilateral abnormal skin reflexes in common hemi-

*Chaddock: A New Reflex Phenomenon in the Hand: The Wrist-Sign. (*Interstate Med. Journ.*, Vol. XIX, No. 2, 1912.)

plegia are: Babinski's sign, ankle-sign (or not), no wrist-sign, on the paralyzed side; ankle-sign and wrist-sign, on the unparalyzed side. This association of signs is diagnostic of a lesion of one pyramidal tract above the level of its decussation. The implication of nerve functions of the unparalyzed side of the body is to be explained by lesion of homolateral pyramidal fibres which have an anatomical association in position with the crossed fibres of the tract only above the level of the decussations.

Study of actual associations of these signs form the basis of the following interpretations of them:—

1. Lesions of mild intensity of influence on innervation through one pyramidal tract, seated above the level of major decussation, cause an ankle- and wrist-sign to appear on the opposite side of the body. When both tracts are equally implicated in this degree, these signs appear on both sides of the body. Usually no paralysis accompanies these lesions.

2. Lesions of greater extent and degree of intensity, which usually (not inevitably) cause loss or diminution of voluntary motor power when located above the decussation on one side, induce Babinski's sign on the opposite side without a homolateral wrist-sign, and an ankle- and a wrist-sign on the same side of the body. Bilateral lesions of similar seats and degrees cause bilateral Babinski signs with no sign at either wrist. Such a condition may exist without a marked degree of loss of voluntary power, though in most cases paralysis will be apparent. If, in cases of double cerebral lesion causing double Babinski's sign, there be a wrist-sign on one side, the presence of the positive wrist-sign locates the more extensive or profound lesion in the motor tract of the hemisphere of the side on which the wrist-sign is found. Operated brain cases have demonstrated the justice of this statement.

3. Lesions located below the level of the pyramidal decussation, affecting the cord, unilaterally or bilaterally, cause a variety of associations of these signs, due to the level and the extent and degree of implication of one spinal motor path or both. A lesion confined in its effect to one spinal motor path causes these signs to appear only on the side of the path implicated, and both extremities or only the lower limb show disturbance of innervation, depending on the level of the lesion. Bilateral involvement of the cord might cause similar or unequal bilateral signs; but here bilaterality of signs is a sure index of bilateral lesion, either direct or indirect. Associations of these signs in cord lesions may be like the associations of them due to lesions located above the decussation, but in the majority of cases the differentiation of location between brain and cord is readily made by other signs and symptoms that usually accompany them when they are due to lesions of the cord. The comparative smallness of the cord and the intimate relation by proximity of motor and sensory paths accounts for the

fact that pure motor or pure sensory symptoms of cord disease are extremely rare. Experience teaches that pure motor anomalies are usually due to disease above the level of the cord; that cord lesions of insidious and gradual incidence usually induce first subjective sensory symptoms and later motor symptoms. Until we had at our command the newer signs of motor involvement, there was supposed to be possible a prolonged period between the incidence of sensory and the development of motor phenomena. Now it is common to find an immediate coincidence of slight subjective and objective sensory symptoms with the milder evidences of implication of the spinal motor paths. The signs and symptoms of a gross character, like disturbances of the reservoirs; marked paralyses, flaccid and spastic; disturbances of the deep reflexes—exaggeration and abolition; the Brown-Séquard syndrome, etc. need not be here considered.

When we recall the varying depth of the pyramidal tracts with relation to the pia sheath of the cord, it is readily understood that a limited meningeal inflammation might cause mild perturbation of one or both pyramidal paths, especially in the lower levels of the cord where these tracts come to lie finally immediately beneath the pia.

Segmental and radicular disturbances of sensibility have long been guides in the determination of the upper level of lesions implicating the cord. Horsley laid down the rule to the effect that the upper limit of the cord lesion lies three segments above that indicated by the upper limit of anesthesia.*

The more recent researches of Babinski and his pupils have added several elements which lend precision to spinal localization, so essential in cases of neoplasms or other causes of spinal compression. According to this school, in the immense majority of cases the superior limit of *hypesthesia* shows directly the upper limit of spinal compression, but this must be determined or delimited with great care by light touch and heat and cold.

It is quite as important to determine also the lower level of a spinal lesion, especially by compression. Babinski and Jarkowski have shown the value of the cutaneous reflexes of defense for this purpose. These reflexes are involuntary movements of sudden flexion of the lower extremities on the trunk excited by irritation (scratching, pinching, pricking, faradic current, hot or cold object) of the skin at almost any point below the level of the cord lesion. But Babinski emphasizes the point that these reflexes of defense can be utilized with confidence, as indicating the lower limit of a cord lesion, only when they can be excited from the skin of the abdomen and trunk. Usually the integument of the lower limbs is much more excitable (for reflexes of defense) than that of the

*Gendron: *Tumeurs de la Moelle*, etc., p. 57. Maloine. Paris. 1913.

body; and Babinski* states that there are cases of spinal lesion of the upper dorsal cord which present no reflex of defense above the limit of the integument of the lower extremities; and that therefore the upper limit of excitability of these reflex movements must be found at some level on the trunk before it can be used to establish the lower limits of a lesion of the cord.

Elsewhere, I have suggested the use of an ethyl chloride spray as a means of determining the upper limit of excitability of the reflex of defense by cold.**

Babinski† gives the following résumé of his utilization of the foregoing facts:—

1. While the typography of the anesthesia [hypesthesia] ordinarily affords a means of recognizing the upper limit of spinal compression, generally the lower limit of this compression can be fixed by ascertaining the upper limit of the territory of the reflexes of defense.

2. When these two points are clearly ascertainable, they usually permit the determination, by their association, of the extent in length of spinal compression; each for the other is a control, and taken together they make the localization more certain and more precise.

This review has been made to show the possible utility of some of the newer neurological diagnostic signs, and point out their early diagnostic value in the insidious nervous lesions that may arise from tuberculosis.

Considering the frequency of nervous tuberculosis in the young, and that tuberculous invasion of the nervous system is usually gradual and insidious, it is at once suggested that infants and children should be examined early neurologically, as far as possible, so that in case of subsequent illness a record of nervous findings may be had for comparison.

My contention that the phenomenon of Babinski is not normal in infancy will doubtless meet with objections,†† but if it lead only to a re-examination of the accepted doctrine, I feel sure that data of value to neurologists and pediatricists will be obtained.

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*Babinski: *Travaux Scientifique*, p. 106. Masson et Cie. Paris. 1913.

**Chaddock: *A New Diagnostic Nervous Sign*. (*Interstate Med. Journ.*, No. 7, Vol. XVIII, 1911.)

†Babinski, *op. cit.*, p. 107.

††Babinski, *op. cit.*, p. 53.

TUBERCULOSIS AND GENIUS: WITH PARTICULAR REFERENCE TO FRANCIS THOMPSON.

"I recall a poet . . . In his case the psychological manifestations were undoubtedly associated with disorder of the body." — Personal allusion in Thompson's prose essay "Health and Holiness."

By ARTHUR C. JACOBSON, M. D., of Brooklyn, N. Y.

In a paper published by the author about six years ago* the influence of the toxins of tuberculosis upon temperament and genius was exhaustively discussed and many instances cited. While this article was being written Dr. John Bessner Huber published, in 1906, his well-known book "Consumption and Civilization." A chapter of this book is devoted to a discussion of the influence of tuberculosis upon literature and the arts, with special consideration given to Robert Louis Stevenson, Chopin, Keats and Marie Bashkirtseff. It clearly sets forth that "the quality of genius may, in some cases at least, be affected by tuberculosis." Thus Huber and the present writer worked on the same theme and arrived at identical conclusions without knowledge of each other's researches; indeed, a long time elapsed before the two sets of data were critically compared. It would seem that the validity of Huber's conclusions could have been established in no better way than by the close-following publication of the same findings by an independent worker.

The spurring influence of the *spes phthisica* upon the creative mind has, of course, often been noted by puzzled observers, as in the case of Schiller, of whom his biographer, Nevinson, wrote that "it is possible that the disease served in some way to increase his eager activity, and fan his intellect into keener flame." Certain phrases of Keats would seem to show that he apprehended the same influence, and Lanier gave himself up quite understandingly to the intoxication. So the workings of the psychological switch-board under this special stimulus have often been noted and commented upon by mystified laymen and by some of the inspired geniuses themselves, and physicians of understanding in such matters have doubtless observed them too; but Huber's book contains, so far as the present author has knowledge, the first scientific discussion of this very interesting phase of psycho-pathology.

Stevenson is probably the most familiar example of the genius

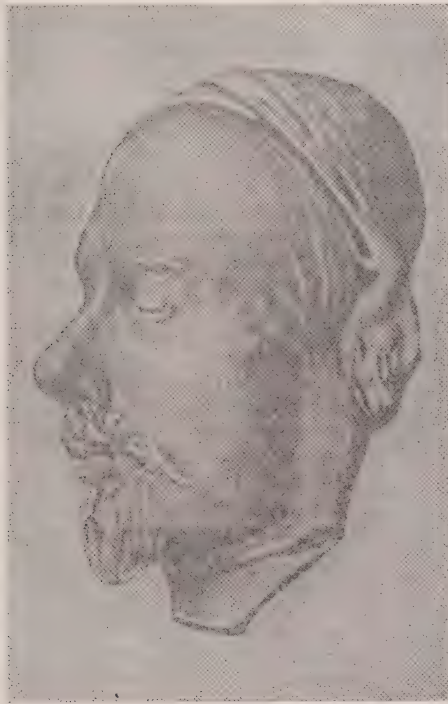
**Medical Library and Historical Journal*, December, 1907, and *Æsculapian*, December, 1908.

whose powers are quickened by reason of the general psychic excitation resulting from the action of tuberculous by-products. The natural optimism of such a mind is intensified by the characteristic effect of the toxins until, strange paradox, evil is seen to incite good,—pathology to warm and color delightful qualities of temperament. We see a very similar instance in Emerson, likewise an intense optimist. Other notable examples of genius as influenced by tuberculosis, studies of all of whom appear in the author's earlier paper, have been John Milton, John Locke, Alexander Pope, Percy Bysshe Shelley, Tom Hood, Laurence Sterne, Thomas De Quincey, Elizabeth Barrett Browning, Molière, Henry Thoreau, Goethe, Balzac, Jane Austen, Samuel Butler, Edward Gibbon, Voltaire, Francis Beaumont, Walter Scott, Dr. Johnson, Baruch Spinoza, Georges de Guérin, David Gray, Amiel, Washington Irving, John R. Green, Richard Baxter, Charlotte Brontë and her almost equally distinguished sisters, Emily and Ann, Rousseau, John Ruskin, Charles Kingsley, Robert Southey, Nathaniel Hawthorne, Toru Dutt, Robert Pollok, Hannah More, Pierre Jean de Béranger, William Ellery Channing, Immanuel Kant, "Thomas Ingoldsby" (Richard Harris Barham) and James Ryder Randall. In addition to these may be mentioned Mozart, Descartes, Mérimée, Richelieu, Raphael, Bastien-Lepage, Jacquemart, Trutat, Watteau, Paganini, von Weber, Nevin, Purcell, Rachel, Laënnec, Bichat, Cardinal Manning, Rush, Trudeau, Godman, William Pepper (2nd), Calvin, Cicero, Cecil Rhodes, Saint Francis of Assisi and the great surgeon Dupuytren, of whom Dr. James J. Walsh has written a sympathetic study in which are described his feverish activities.

The writer is in no sort of sympathy with the theory of some people that genius is a disease, and he has been at some pains to combat it as vigorously as lies in him in an article recently published.* Genius makes for disease (e. g., insanity), but disease cannot, of itself, account for genius. The author is far, then, from claiming that tuberculosis can make a genius of a man, or that it can create even the initial spark. He merely predicates it to be a quickener of already germinating or flowering faculties of extraordinary potentiality, which even without its influence would have marked their possessors as men of remarkable talent or genius. It would be as great an error to advance an argument seeking to prove that any genius was a genius because he was tuberculous as to reason that any genius was a genius because he was 'crazy.' It is perfectly evident that many representing the very highest types of genius have owed nothing to the *spes phthisica*, that is, were not tuberculous. Indeed, we may say that while the genius is exceptionally prone to disease, he is not, as a rule, attacked by tuberculosis. On account of his peculiar nervous organization he

**Medical Record*, November 23rd, 1912.

is more likely to be claimed by insanity or some allied disability, which may destroy his productivity or color his creations, as it did those of Tasso, Cowper, St. John, Guy de Maupassant, Byron and Poe. As a watch is not built to withstand lawn-mower usage, so the delicate organization of the genius is apt to be injured by the hard conditions of our social system, and it is absurd to reason that insanity is ever his good angel. It is his Nemesis, and he does his work not because of, but in spite of, the Damoclean sword. While often of insane temperament, his greatest creative work reflects the man at his best, that is to say, sanest. And to the degree that clinical insanity enters in, to that degree is his work vitiated.



The Life Mask. 1905.

We may conceive of the insane diathesis as implanted in accordance with nature's law of compensation. That is its only significance in relation to genius. One can readily understand how misconception and confusion have grown out of the frequent association of genius and disease. The prevailing error has been a putting of the cart before the horse—a confusion of cause and effect.

The difference, then, between insanity and tuberculosis in their effects upon genius, is that the one is antithetic to the faculties that actuate the creative mind, while the other is synergetic. Neither accounts for the fundamental quality of mind which characterizes genius and which is *svi generis*. Upon the already set psychological

switchboard each merely exerts its good or bad effects, as the case may be, like the many other factors which influence human life and thought.

Despite all that has been said by Huber and the author as to the true rôle of tuberculosis in this sphere, there is hardly any doubt that the popular view will come to approximate that in respect to the relation of insanity to genius. The unsound vulgar view will prevail as regards tuberculosis, because the crowd adopts bizarre and sensational doctrines by preference. For the same reason it holds to a belief in the essential 'craziness' of genius. Intellectual plebeians and the bourgeoisie of science also foster the latter view because they do not desire to do justice to those who possess the greatest gift of God to man, not always with conscious venom, but because of natural dislike and misunderstanding of creative aristocrats so divinely different from the common mould of men. Under Socialism genius would find its Procrustean bed still more difficult to lie in. Said Charles Leonard Moore in the *Dial* recently: "The great cause which is being tried in the world to-day is that of Genius vs. Democracy. The people everywhere are refusing to admit the existence of superiorities. Hence what M. Faguet calls 'the Cult of Incompetence.' Democracy in art and literature is certainly unthinkable, a contradiction in terms. These things are of and for the few—the many simply do not know what to make of them; only in their weakest or most utilitarian forms do they appeal widely. So powerful in America, however, is the set of the democratic current that nothing can make head against it. Preachers, professors, politicians, Presidents—all, like the Sausage Seller in Aristophanes, bring their sweet little honey-cake to the great Demos. They return in flattery what they get in pay. If an infinitesimal part of the effort and expense, which with us have gone to make the intellectual halt half-whole or the intellectual blind capable of groping, had been given to develop promising talent, we should be to-day all one blaze of glory. But our motto has been, 'Let us rally round our mediocrities, for our geniuses can take care of themselves.'" Well, very often they cannot, for, as we shall see, the genius is apt to be a good deal of a child, so far as meeting the issues of material life is concerned. Then, because the light of fame brings out flaws which would not be apparent in ordinary people, we assail even the successful genius with the vicious, ignorant, unfair, petty and ill-tempered judgment that he is a genius because, forsooth, he is insane, by which a very deep disgrace is implied. This is another vulgar view—that insanity is a disgraceful condition. So to all these foolish beliefs will be added another, postulating tuberculosis along with insanity as accounting for genius.

With this general introduction the writer begs now to present a

study of a man who, perhaps better than any of the subjects of his first essay, typifies the tuberculous genius of the highest order—Francis Thompson, English poet and “the greatest achievement of Catholicism in the nineteenth century.” Like Keats, he was a student of medicine. He studied medicine for six years at Owens College, Manchester, but failed three times in examinations for the degree. His father, who was a physician practising at Preston and Ashton-under-Lyne, had first tried to make him a priest (both his parents were converts to the Roman Catholic Church), and until he was seventeen, when he took up medicine, he was in training at Ushaw College. After his failures his father appears to have cast him off utterly, whereupon he helplessly attempted to earn a living in the humblest ways, finally going to London, in November, 1885, being then about twenty-six years of age. He worked at first as a publisher’s collector, afterward selling matches, newspapers and pencils. He also ran errands, held horses and worked in a bootmaker’s shop, sleeping at night on the waste ground near Covent Garden, where the refuse of the great market was thrown. Thus destitute and ill, he became a victim of laudanum, which, as with De Quincey, appears to have enabled him to cope with his neuralgia and tuberculosis. Five years of terrible privation and sickness reduced him to beggary. During these years of outcast life he wrote two poems on ragged scraps of paper, “The Passion of Mary” and “Dream Tryst,” and a prose essay, “Paganism Old and New.” These he sent to an editor, Mr. Wilfrid Meynell. Believing that they were not accepted he attempted suicide by taking laudanum but was saved by Mr. Meynell, who had traced him to the refuse heap, his interest excited by the remarkable character of the contributions. He was induced to enter a hospital and afterward sent to Storrington, Sussex, to recruit. He then wrote the “Ode to the Setting Sun,” other verse, and the “Essay on Shelley.” His genius was promptly recognized by Browning and Coventry Patmore. In 1893 he published his first volume of “Poems,” written chiefly at Storrington, of which the best known is the “Hound of Heaven,” marked by marvelous spiritual insight, metrical beauty and incomparable imagery. In 1895 “Sister Songs” were published, dedicated to the children of Wilfrid and Alice Meynell, his friends and protectors. They describe the days of his outcast experience. From 1893 to 1897 he lived mostly near the Franciscan monastery in Pantasaph, North Wales, cared for by the monks. In 1897 he published the “New Poems,” written for the most part in Wales. Of these the “Mistress of Vision” and the “Anthem of Earth” rank high. Of his prose work the “Essay on Shelley” abounds in striking thought and verbal beauties. A devout Catholic, of ascetic temper and mystical prepossessions, he may be called the laureate of his Church, though the world claims him as one of its immortals.

He entered the Hospital of St. Elizabeth and St. John, in St. John's Wood, in the summer of 1907, and died there on November 13th of the same year. He was buried in the Catholic cemetery at Kensal Green. His tomb is inscribed with his own words: "Look for me in the nurseries of Heaven."

That last phrase furnishes one of the keys to a proper understanding of Francis Thompson's character. This "most august and pontifical of poets," towering over all the "filigree poets and measurers of syllables" of his age, retained to the end the child-spirit. It is said that the great artist never outgrows his childhood; his intuition, piercing through things, is the intuition of the child. Much is lost to grown-up vision. Thompson views the world with the grave and solemn wonder of the child. Being a child, with no responsibilities, no doctrines, and "no heavy sense of an apostolic mission," he sings naturally and unconsciously, like the skylark. His poetry takes a religious turn because he hears Nature speak in the language of religion, in which are cast all his own thoughts. He is not, as has been charged, the poet of a little clique of co-religionists, but second in equipment and power to Shakespeare, according to the judgment of Arnold Bennett and many other competent critics not of the Catholic faith. Thompson was not a drunkard or in any way depraved. Naturally, the circumstances of his life gave rise to suspicions, and these derived apparent support because of a remorseful note in some of his verses. His use of laudanum came about in a manner denoting no moral turpitude whatsoever. His very innocence and saintliness accounted for many of his difficulties; only purity and sincerity inspired his pen.

Thompson's life on the streets of London was the life of a perplexed child, thoroughly bewildered by the confusion and conflict of city life and unable to meet its distresses and discomforts in any way commensurate with his tremendous powers. Yet before he died this glorious bootblack and beloved vagabond of song was in great demand as a critic and essayist by the great English literary journals. The world should never give up its atypical boys, says Bliss Perry, speaking of the late maturity of Rousseau. Mendel himself was never able to pass examinations. The world ought never to give up the Thompsons, for all their incapacities. Out of their very failures have come successful careers, and over physical degradation have they won victories and towered in intellectual glory. This is something that ought to be remembered by those who are so dogmatic in classifying our so-called defectives. They would not recognize a potential Thompson or a Verlaine, much less distinguish the types. But then they are working for the precious purposes of democracy.

So the life of this shy and sensitive soul, or breath, rather than man, was a kind of dream. Wyndham calls him an angel ascend-

ing the iridescent ladder of sunlit imagination. No poet since Shakespeare has attained to his wealth of imagination, subtlety of thought, or magic of language. Read the "Hound of Heaven," and that sublime "Ode to the Setting Sun," ye lovers of Shelley and of Keats, and believe! He differs from the phrase-makers and æsthetes in that his message is the truth. Truth is the simplest of things, and we have the word of that other child, G. K. Chesterton, that religious imagery, so far from being subtle, is the only simple thing left for poets. So far from being merely superhuman, says this fascinating infant, it is the only human thing left for human beings. Thompson appeared at a time of gross materialism and unbelief, at a time when the dogmas of science had enthralled men's minds to the exclusion of spiritual beauties and of faith. In this modern world, but not of it, Thompson, says some writer, had been set down by the angels on an earth which had just outgrown its childhood. What a miracle that the glorious music which expresses this man's splendid faith should have arrested such a world's attention! What does the miracle signify? It means that it is possible for the mystic to set at naught the materialist; to bear him down by sheer spiritual power against which the negations of those enslaved by the hierarchs of science and the priests of human pedantry avail nothing—if the mystic be a Thompson capable of revealing even to the crass modern mind "The Divine Presence, which is beauty." Martin D. Armstrong has explained the difference between the mystic and the materialist in terms the convincing force of which even the materialistic physician must concede.* Reason, he says, is the outcome of experience: it is a science built up of millions of tabulated facts, a theory evolved from certain data. Each new fact is another datum, and every additional datum must alter the theory. Hence reason is an unstable quantity, an instrument of limited power. "Reason, or the ratio of all we have already known, is not the same that it shall be when we shall know more." Reason must be judged by life, not life by reason. Nietzsche said: "The more abstract the truth you wish to teach, the more you must allure the senses to it"—the senses which are the only channels to the soul. Bergson's philosophy mistrusts reason in all the profounder matters of life and regards the emotions—in other words, the promptings of the living soul—as the only reliable guides.

As was the case with Keats, Shelley, Lanier, Schiller and many of the other creative minds discussed by the author in his earlier essay, the time of our "God-smitten" poet's greatest productiveness coincided with the most active period of his disease.

Like De Quincey, Thompson was succored in London by a girl of the streets—one of those women, who, to De Quincey, "were

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simply sisters in calamity, and sisters amongst whom, in as large measure as amongst any other equal number of persons, commanding more of the world's respect, were to be found humanity, disinterested generosity, courage that would not falter in distress of the helpless, and fidelity that would have scorned to take bribes for betraying." The world is indeed indebted to the one of this class who saved to it a man who was to create works before which the voice of criticism is dumb. Thompson describes the incident in the following lines:—

"Forlorn, and faint, and stark,
I had endured through watches of the dark
The abashless inquisition of each star,
Yea, was the outcast mark
Of all those heavenly passers' scrutiny;
Stood bound and helplessly
For Time to shoot his barbèd minutes at me;
Suffered the trampling hoof of every hour
In night's slow-wheelèd car;
Until the tardy dawn dragged me at length
From under those dread wheels; and, bled of strength,
I waited the inevitable last.
Then there came past
A child; like thee, a spring-flower; but a flower
Fallen from the budded coronal of Spring,
And through the city-streets blown withering.
She passed,—O brave, sad, lovingest, tender thing!
And of her own sad pittance did she give,
That I might eat and live:
Then fled, a swift and trackless fugitive."

This was a momentous gift of one child to another; one which saved, for a time sufficient for the recipient to do his work, the life which later

"Faded from a garden to a grave,
Passing without a tear into the stars."

SOME PSYCHIC TRAITS OF THE TUBERCULOUS.

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Glancing through the advertisements of quacks and medical charlatans in the newspapers published in New York City, we are struck with the fact that in the main two groups of diseases are exploited by these meanest of human parasites: Venereal and sexual, and diseases of the respiratory organs, especially phthisis. Bearing in mind the principle that advertising must pay good returns on the investment of those who buy space in periodicals, we are safe in concluding that the profits in these investments must be considerable.

Conversely, the fact that other chronic diseases, which are not at all scarce, such as disorders of the gastro-intestinal tract, rheumatism and all that passes as such, nephritis, cardiac disease, cancer, etc., are less frequently exploited by advertising quacks, tends to prove that sufferers from these maladies are less gullible to allurements of the fraudulent advertiser who promises thorough examinations, sure and speedy cures.

In the case of venereal and sexual disorders we can easily decide upon the cause why it 'pays to advertise.' Their great frequency gives the quack a wide field to exploit. The writer is under the impression that the fact that they are 'secret' failings of humanity is of more importance in this regard. But why so many quacks find it remunerative to invest large sums for newspaper space to allure unfortunate consumptives is not so clear. Of course, the great prevalence of tuberculosis is an important factor, but it does not explain all. Other chronic diseases are sufficiently frequent in every community and they would be exploited by charlatans if it paid to advertise sure cures for them. But for rheumatism, gastritis, diseases peculiar to women, cardiac and renal diseases, etc., nostrums are usually offered and treatment by correspondence is advertised, and only exceptionally does a quack offer his skilful treatment for their cure, as is the case with consumption.

A careful inquiry into the mental traits of the average consumptive reveals the cause why he is so often the victim of fraudulent advertisements. As a result of a prolonged state of intoxication by the toxins of the tubercle bacilli, the tuberculous is no more in a normal mental state than is one who is under the influence of mild alcoholic intoxication. For months there is going on in the body of the consumptive an overproduction of toxins which circulate in his

blood. These toxins are derived from the metabolism of the tubercle bacilli and other micro-organisms which are secondarily implanted in the tubercular foci, and also from the destruction of tissues at the site of the lesions, especially when there is defective or suppressed evacuation of secretions. The general effects of tuberculin are of a toxic nature, as is evident when we consider the condition of a patient with a typical tuberculin reaction. Then the external appearance of a consumptive, who is rarely, if ever, free from febrile or subfebrile temperature, betrays his state of intoxication. His bright eyes with dilated pupils which at times are contracted unilaterally or bilaterally, the flashing cheeks, the keen intellect which is so often met among those who were before the onset of the disease dull in this respect, coupled with a flickering intelligence which brightens up suddenly for a few hours but is soon followed by mental depression or fatigue, bear close analogy to the condition of the average person under the influence of moderate doses of alcohol.

Persons in a state of intoxication are highly susceptible to suggestion and those under the influence of the tuberculous toxemia are no exception. Barring the functional neuroses, the writer does not know of any other disease in which suggestion is as frequently effective as in phthisis. It must be emphasized right here that when speaking of the vulnerability to suggestion, the writer does not refer to hypnotic suggestion, when the patient is asleep, but to suggestion in the waking state. To be sure everybody is more or less amenable to suggestion; this is a general human trait, but in the tuberculous it is greatly exaggerated. This is evident from the effects of an injection of water which is used in many European sanatoria at the beginning of a tuberculin cure as a routine measure with a view of ascertaining whether the fever is due to psychic effects or to the tuberculin. In some sanatoria it has been found that as many as 20 per cent. of the patients treated with tuberculin reacted to the so-called *injectio vacua* as to tuberculin. Some physicians have been able to suggest the hour of the day when the reaction shall appear, as well as any or all the symptoms which are part and parcel of the typical tuberculin reaction. Insomnia of consumptives is quite often relieved by hypodermic injections of water, more often than in other diseases, and the cough can very frequently be controlled by suggestion, or by a placebo which is essentially refined suggestion, more often than is generally appreciated.

A study of the various old and new remedies, or systems of treatment which have been recommended every year or two for the cure of tuberculosis shows clearly that the vast majority have been effective because of the suggestion that has usually accompanied the treatment. It is a striking fact that the proportion of cured, improved, unimproved, or dead cases under nearly all methods of

treatment of tuberculosis is practically the same during the first few years after the introduction or exploitation of the new method or preparation. Even the various methods of treatment in vogue to-day, contradictory as they often are, give practically the same percentage of cured and improved cases. Thus while many show undoubtedly excellent results in high altitudes, there are others who bring conclusive proofs that the number of cured or improved at sea level is not at all less than in mountainous regions. While most patients look for regions that abound in sunshine and attribute the cure or amelioration of their disease solely to this cause, there are others who have listened to Major Woodruff's warnings and avoided sunshine, sought places in which they were sheltered from the dangerous actinic rays and recovered in the same proportion as those who lived in places with a maximum of bright sunny days.

It appears from a study of the statistical reports of sanatoria in various parts of the world that in each climate the proportion of cases discharged as 'cured,' 'disease arrested,' 'improved,' 'unimproved,' and last, but in this case for well-known reasons invariably least, 'dead,' is about the same. All these institutions, whether exploited for private gain, endowed by philanthropy, or maintained by the state, located in high or low altitudes, at the seashore or inland, in cold, warm, or moderate climates; irrespective of the special method of treatment or fad followed in the institution, indoors, outdoors, or in tents; immaterial what the standby of the presiding genius may be, dietetic like the milk, the grape, the buttermilk cure; even when some medicinal substance like creosote or arsenic or their derivatives are vaunted, or even the specific treatment with the innumerable kinds of tuberculin which in the hands of the given physician is superior to all others, they all give the same results if judged by the number that have been cured or improved.

There are many phthisiotherapists competent to give authoritative opinion who are convinced that tuberculin as generally administered in minute doses acts more by suggestion than by specific action on the tuberculous process in the lungs. If the writer's limited experience with the agent does not sadly deceive him, he believes that he is safe in saying that as a rule tuberculin treatment is only efficacious in intelligent patients, who are under the impression that they have mastered the theoretical aspects of infection and immunity and of specific therapy from reading popular books and articles on tuberculosis. In the writer's experience ignorant patients hardly ever improve under tuberculin treatment because they cannot understand the benefit of fever, malaise, pain in the limbs, etc., which are the frequent concomitants of the tuberculin reaction. On the other hand, intelligent patients look forward to the reaction as an indication that the tuberculin is working on their system, and they often improve when only small doses have been given.

The powers of suggestion in the specific treatment of tuberculosis was shown in drastic manner by Albert Mathieu and Dobrovici, who announced to the tuberculous patients at the Andral Hospital in Paris that a new discovery had been made, a new serum had arrived for the cure of tuberculosis, and that shortly a sufficient quantity of the remedy would be available for those who need it. The patients had to wait for some time, and when the serum arrived, they all rejoiced. The new remedy consisted simply of physiological salt solution but was given the pompous name *Antiphymose*. Certain patients were told that they were fit subjects for antiphymose, while others were denied the treatment on the plea that it would not do them any good. The selected patients were placed under careful observation and their history was again recorded minutely, so that all felt that they had been seriously given the first opportunity to benefit by a great discovery. No change was made in the surroundings of the patient and the diet, and all other medication was discontinued.

The patients were greatly impressed by the new remedy and the favorable results exceeded all expectations. Within a couple of days there was noted an improvement in the appetite; those who had fever before showed a normal temperature, and the cough, expectoration and night-sweats were ameliorated; those who had hemorrhages ceased bleeding, and even the physical findings in the chest showed distinct signs of amelioration of the process. The gain in weight was remarkable, ranging from 1,500 grm. to 2 and 3 kgrm. As soon as the injections were discontinued, all the old symptoms reappeared.

From personal experience with the culture of turtle bacilli injected by Dr. F. F. Friedmann into patients under the writer's care at the Montefiore Home in this city, he can say that its effects were practically the same as those from Mathieu's *Antiphymose*. Our patients were carefully selected, and all who were told that they were not fit for the treatment felt very much disappointed and complained bitterly, displaying their jealousy in no uncertain terms. Those who were fortunate in being selected for treatment by the great German discoverer were overjoyed and felt confident of a sure and speedy cure. For weeks they waited; and finally on the day the specialist was positively expected the fortunate patients were all separated from their less fortunate co-sufferers and assembled in a room in which the entire staff of the medical men of the hospital and the invited guests were flocking around to witness the 'demonstration,' everyone inquiring about the history, symptomatology, and condition of each patient. The wait for the *savant* was invariably long—he never came in time; and when he arrived within an hour of the appointed time, we thought that he was unusually prompt. Of all the patients that were selected for him by the hospital staff and his own clinical assistant he treated but a



Francis Thompson

*From a drawing by the Hon. Neville Lytton.
October 1907*

few and announced that he had not enough of the culture for the rest; and the disappointment of those who had to return to the wards without injections was only equaled by the joy of their neighbors who were fortunate in this respect.

It is thus evident that what playwrights call suspense was not in the least lacking; indeed, it would have satisfied Belasco for one of his successes on the stage. On the other hand, Charcot, Bernheim, Munsterberg and other psychotherapists could not wish any better preparation of their subjects for a séance; in fact, any cheap vaudeville magician would be satisfied that the opportunity for making an impression on bewildered and susceptible people was unexcelled. Without burdening the readers with the details of the 'demonstration,' the writer only wants to mention that Dr. Friedmann was interested exclusively in the subjective feelings of the patients, and assured each one that these would disappear within a couple of days. The patients were so overwhelmed that not one complained about the pain inflicted with the needle while making an intramuscular injection—a rather unusual occurrence among our patients.

Sure enough, within one to three days, nearly all the patients ceased coughing, the amount of expectoration diminished, sleep returned to those who suffered from insomnia, and night-sweats were greatly ameliorated; weights began to increase, going hand in hand with the improvement in the appetite which was observed in most cases, although the writer can say that the temperature was not at all influenced either way by the treatment in the majority of cases. During the three months after the administration, these patients were kept under careful observation by the house staff of the hospital, by the visiting physicians, and by the medical officers detailed by the United States Marine Hospital Service and the Health Department of the city, so that almost every day they were examined minutely and questioned about their subjective feelings. Contrasted with the monthly examinations which they formerly enjoyed, the patients were greatly impressed by the frequent examinations by various physicians and the interest taken in them by everybody, and nearly all felt happy and well.

At the end of three months we found that the lesions in the lungs either remained stationary, not an unusual occurrence among the tuberculous patients of the Montefiore Home, without turtle cultures and 'demonstrations' by foreign professors, or showed distinct signs of extension and aggravation of the lesions, and where formerly infiltrations were found we now could discover cavities. A statistical study of the weights showed that on the whole these patients had not gained more than those who had not received the turtle treatment. Just at that time the newspapers began to write less sympathetically about the German professor and intimated that the treatment was a distinct failure, quoting some qualified phy-

sicians to the effect that the turtle culture was not only not beneficial, but decidedly harmful. The patients read about it and discussed it as tuberculous patients in institutions are apt to do about anything that concerns their malady. As by a miracle all the improvements in the subjective symptoms of the patients vanished, going hand in hand with severity with which the newspapers arraigned the treatment, and when finally the press began to ridicule the turtle 'serum' all the old and annoying symptoms reappeared and the patients relapsed into that state which is characteristic of the stage of the disease in which each individual found himself.

The writer believes that he has here an excellent illustration of the heightened susceptibility to suggestion of the average consumptive. No one will deny that the vast majority of people, healthy and sick, are amenable to suggestion in various ways, but it must be acknowledged that a group of patients suffering from acute or subacute gout or rheumatism, heart diseases in a state of decompensation, of nephritis complicated by dyspnea and dropsy, of ulcer of the stomach, of cancer, or any other organic pathological entity, would not be influenced to the same extent by suggestion as were the consumptives just mentioned.

It appears that consumptives in all stages of the disease are susceptible to psychotherapy. The writer has observed that the vast majority, especially those in the advanced stages, improve temporarily when they change their medical adviser, even when the latter institutes no change in the treatment at all, but only goes again into the details of the history of the case and examines the patient minutely. He has repeatedly seen marked improvement in the subjective symptoms of patients who were told by their physicians that nothing could be done for them because they are doomed, while the new physician, who was promptly called because of the extreme prostration of the patients, assured the unfortunate sufferers that there was no danger at all, and that only careful treatment was necessary to rehabilitate the lost health and strength, and afterwards a short visit to the country would enhance the chances for ultimate recovery. The writer has seen improvement in a patient after three punctures were made in her chest with a view of inducing an artificial pneumothorax, but no nitrogen was introduced into the pleura because of adhesions. Yet, the temperature which had been quite above normal for weeks promptly dropped to normal and the patient felt well. That tuberculous patients as a rule improve during the first few weeks or months in a new resort or institution is a well-known fact; and that it is usually not the superior climatic conditions or the different method of treatment that was efficacious in this respect is proved by their relapse into their former condition, or by the aggravation of their disease, after the novelty of the new surroundings begins to wear off.

The average consumptive, especially in the advanced stages of

the disease, is not only excessively vulnerable to external, or hetero-suggestion, but also to auto-suggestion, some even to the degree encountered in cases of major hysteria. This is best seen in the euphoria and euthanasia of the class of sufferers which medical authors have described in such great detail, and which writers of fiction have not overlooked and have used for strong dramatic effects. Experience has taught the writer that when a patient with large excavations in the lungs, running high fever and presenting all the concomitant signs and symptoms of this condition, begins to believe that he has improved, that he 'feels fine,' has no pains, does not cough distressingly, he looks for a speedy relief of the unfortunate by death, which is the greatest benefactor for these desperate sufferers. It is often astonishing to behold the sinking man making plans for the future, engaging in new enterprises, planning long voyages, not for the purpose of a cure which he believes he has almost attained, but for pleasure. The writer has met one who twenty-four hours before his death insisted that his fiancée marry him soon and planned a grand ceremony; another one of his patients succumbed while attempting sexual intercourse with his wife, and the writer has been told by the wives of several of his patients that the exciting cause of the pulmonary hemorrhages was sexual intercourse—in one case death occurred under such circumstances.

It is the opinion of the writer that this euphoria is more often encountered among intelligent and cultured consumptives, while among the ignorant and stupid it is only rarely met with. This confirms the generally accepted opinion that the euphoria in phthisis is explained in a great measure by auto-suggestion, because the stupid do not think much. Muralt says that the euphoria in the final stages of phthisis reminds one of the euphoria of septic patients, and suggests that perhaps mixed infection plays a prominent rôle in its production. He also points out that the weakness of judgment of the consumptive refers only to their own morbid ego, while their intelligence for external matters remains quite intact, which the writer can confirm. Their egoism, of which the writer spoke in detail elsewhere, is so pronounced that they cannot believe anything may be dangerous or painful to their ego, provided ordinary care is taken. On the other hand, it must be recalled that when the septic condition of phthisis overwhelms the patient with toxemia it is more effective than in others, because the wasted and emaciated remnants of the body are rather small for the comparatively large doses of toxin. As a result, the reflexes are abolished, the cough which for a long time has been most distressing is diminished or ceases altogether, and all the aches and pains which have tortured the unfortunate sufferer, making his life miserable for months, vanish; but the intelligence remains quite intact so that they can delude themselves that at last some signs of improvement have appeared, and that careful treatment will bring them around shortly.

It is because of the heightened susceptibility to suggestion of the tuberculous that so many quacks thrive on them and succeed in robbing them of their last cent, and so many consumption cures are exploited, the promoters often obtaining testimonials that the nostrum has improved or cured hopeless cases after physicians have given them up in despair. Even capable and conscientious physicians are often deceived through the suggestibility of their tuberculous patients, and are led to believe that their method of treatment has been instrumental in bringing about cures 'in a certain proportion of cases.'

Before deciding on the efficacy of a preparation or method of treatment of tuberculosis, we must always bear in mind the mental traits of the tuberculous. The only way to test tuberculin, cultures, or drugs in the treatment of phthisis, is to administer them to a large number of patients and at the same time, and in the same institution to inject an equal number of consumptives with salt solution, taking good care that the patients do not know which are getting the remedy and which the *injectio vacua*, thus eliminating the element of suggestion.

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TUBERCULOSIS OF THE KIDNEY.

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In a recent article published in the JOURNAL,* the writer has called attention to the great variety of clinical pictures under which tuberculosis of the kidney may present itself. Further experience since the above paper was written confirms the opinion that it is only by keeping constantly in mind the possible presence of this disease, both in the acute and chronic affections of the urinary tract, that we can hope to make a diagnosis at a period when surgical intervention in the shape of a nephrectomy can still be of avail. In writing this second article upon the same subject, the writer knows of no better method to impress a few of the salient clinical facts upon the general practitioner, and even his fellow surgeons, than to give abstracts of a few of the more interesting types of tuberculosis of the kidney that have come under his observation during the past year. Before the discussion of these types of cases, let us review a few of the salient facts in regard to this disease. Tuberculosis of the kidney occurs in two forms, (a) the miliary or subacute variety, which is a portion of a generalized miliary invasion and cannot be recognized as invading the kidney alone, and (b) the chronic form which we can recognize clinically. As a rule, the disease involves one kidney only in the early stages in over 90 per cent. of the cases, and in these cases the bacilli reach the kidney by the hematogenous route. The earliest pathological changes take place in the papillæ, and from this point the entire kidney is gradually involved. The end stages show the parenchyma completely replaced by a series of cavities containing thick, cheesy pus. The tubercle bacilli are carried to the lower urinary tract as soon as there is a communication of the kidney focus with the renal pelvis, so that the ureter and bladder are next invaded. In some cases the ureter may become occluded at an early stage and the tuberculous changes in the kidney take place without the escape of the purulent urine. In such cases, called closed tuberculous pyonephrosis, the diagnosis is very difficult because the urine may be perfectly clear and it is only when an enlargement of the kidney or fever appear that one can suspect the presence of some form of renal infection. The bladder changes as revealed by the cystoscope may occur early and be quite typical of the disease in the shape of

*April, 1913.

a retracted ureteral orifice with miliary tubercles or ulcerations in its vicinity. But in many cases the bladder symptoms, although quite prominent, are purely reflex, since the anatomical changes in the bladder mucosa are not yet in any manner specific. Yet the presence of an edema around one ureteral opening, or of one-half of the bladder with pyuria in which none of the ordinary pyogenic cocci are present, should be looked upon with suspicion. In the majority of cases, the symptoms are those referable to the bladder rather than to the kidney. Increased desire to urinate, painful micturition, incontinence (especially in children) and retention of urine are the most prominent symptoms on the part of the bladder. Of the renal symptoms, a dull, aching pain or the occurrence of renal colic, when the x-ray is negative for calculus, demands a search for a possible tuberculosis as a cause.

The following cases will serve to illustrate the variety of clinical forms better than any lengthy enumeration of symptoms.

CASE I.—Girl, *æt.* twenty, entered the writer's service in the Michael Reese Hospital, October 16th, 1913, complaining of pain in the left side of back with painful and increased frequency of urination, which began ten months before. Her illness began with very severe pain in the right side of the abdomen, radiating into the back and down into the groin, which recurred every day for three weeks. This pain ceased after internal medication, but two months later she began to have severe pain in the bladder, which recurred every few weeks at first but later appeared almost daily. This pain was of a dull, aching character first felt over the bladder (suprapubic region) and then radiating up toward the left kidney to the epigastrium. She stated that she was getting much weaker, had no appetite, and that urination, which at first was only painful at intervals, had now become quite constantly so. She had severe headaches and perspired much during the day and at night. Her family and personal history was negative. Her father, four brothers and two sisters were alive but all delicate. Upon admission she appeared anemic, and and this was confirmed by blood examination. Her temperature was 100° F. Lungs and heart negative. The left kidney was distinctly palpable and tender. The urine was examined on four occasions, but neither tubercle bacilli nor the ordinary pyogenic organisms usually causing vesical or renal infections were found. Cystoscopic examinations were made on two occasions with similar results. The right ureteral orifice appeared normal and there was no change in this half of the bladder mucosa, but there was marked edema of the left half of the trigone and especially of the ureteral orifice of the same side. This left ureteral opening stood out prominently above the level of the remaining mucosa and was surrounded by such edematous mucosa that few attempts were made to catheterize it. Catheterization of the right ureter was very easy, the urine from this kidney both in quantity and quality being normal. There were no ulcerations in the vicinity of the left ureteral orifice. The diagnosis in this case rested between a specific tuberculous and a non-specific (colon bacillus or ordinary pyogenic cocci) infection of the left kidney. The absence of any organisms upon repeated examinations of the stained urinary sediment spoke more in favor of a tuberculous than an ordinary pus infection. The tenderness over the left kidney, the marked edema of the left ureteral orifice, and inflammatory changes in the left half of the bladder trigone, all aided in localizing the infection as being in the left kidney. This kidney was exposed by the usual oblique incision. The ureter was thicker and firmer than normal, but the kidney appeared at first of normal size and

consistency. After the vessels at the hilus were compressed and the capsule carefully stripped off, one could see (Figs. 1 and 2) about twenty to thirty typical miliary and somewhat larger yellowish-white tubercles standing out prominently above the surrounding parenchyma at the upper pole. Upon the strength of this finding the kidney was removed, and on section showed the earliest stage of tuberculous change upon which the writer has operated. Upon section one could see (Fig. 2) that the entire upper fourth of the parenchyma of this kidney, both cortex and medulla, was studded with typical tubercles standing out prominently above the cut surface. None of these had undergone softening. In the mucosa of the renal pelvis not only adjacent to the foci at the upper pole but also at the lower pole there were a few scattered miliary tubercles (Fig. 2). Her bladder symptoms disappeared rapidly after the operation and she improved greatly in appearance and strength.

Remarks.—In this case the symptoms were at first most marked over the affected kidney, the disturbances of micturition appearing somewhat later. The loss of appetite, color and strength, as in this case, goes hand in hand with the progress of the disease and is subject to the same remissions and periods of improvement as are the changes in the kidney itself. There was no marked enlargement of her kidney, but it was distinctly palpable. The x-ray was negative so that the diagnosis rested between a renal infection due to the colon bacillus (or ordinary pyogenic cocci) and one due to tubercle bacillus. Although we were never able to demonstrate the latter organism before operation, yet the inability to stain any other organism in the centrifuged urinary sediment made us strongly suspect a tuberculosis. The bladder changes were not at all characteristic of tuberculosis, but the marked edema around the left ureteral orifice and left half of the bladder trigone alone confirmed our diagnosis of invasion of this kidney, and justified an early exploration. We were rewarded by finding an incipient tuberculosis of the upper pole of the kidney.

CASE II.—This patient, *æ.t.* forty-seven, married and mother of three healthy children, was first seen with Dr. L. S. Simon in October, 1912. Her personal and previous history was negative. In December, 1911, nearly one year before admission to the hospital, she noticed a burning sensation immediately after urination and was obliged to get up at night to urinate. These bladder symptoms increased until she had an almost continuous rectal and vesical tenesmus and was only able to hold her urine a few hours. The first pain over her right kidney was felt in June, 1912. It began like a renal colic in the right ileocostal space, was very severe but did not radiate. A surgeon in Switzerland, whom she consulted on account of this pain, found a marked cystitis limited to the trigone with swelling of the right ureteral orifice and several flat tuberculous erosions in its vicinity. He also found tubercle bacilli in the urine and noticed flocculi of pus escaping from the right ureteral orifice. He made a diagnosis from these findings of a tuberculosis of the right kidney. When first seen by the writer, there was slight tenderness over the right kidney but no palpable enlargement. Cystoscopy showed both ureteral orifices edematous, but clear urine was seen to escape from the left ureteral orifice. The urine obtained through the right ureteral catheter showed, on staining, a few tubercle bacilli, while the urine from the left kidney appeared normal

as to quality, quantity and response to the phenolsulphonephthalein test. Although at the time of our examination there were no tuberculous ulcerations present in the bladder mucosa, yet the history of the previous examination in Europe and the presence of tubercle bacilli in the specimen obtained by catheterizing the right ureter confirmed the diagnosis of a unilateral renal tuberculosis, and nephrectomy was consented to. The kidney upon being brought into the incision showed a large polar artery passing to the lower pole, and this accessory artery was doubly ligated and severed. The kidney was of normal size but showed even before removal, after stripping off the capsule, a number of large (split-pea) and smaller areas, each consisting of a group of miliary tubercles of a whitish pearly color, raised above the surrounding parenchyma and surrounded by a red zone of hyperemic tissue. The ureter was divided about one inch below the renal pelvis, injected with pure carbolic, ligated and dropped into the wound. The kidney after removal (Fig. 3) showed in its upper pole a typical caseating focus, the size of a filbert, consisting of a cavity with partly smooth and partly typical eroded crater-like tuberculous yellowish-white edges. There was a similar focus at the lower pole, and scattered throughout the cortex and medulla as well as in the mucosa of the renal pelvis one saw a large number of miliary tubercles. There were also several smaller tuberculous cavities in the papillæ. The urine became clear quite rapidly and the painful urination completely disappeared, but there is still (February, 1914) some increased frequency of urination, and the cystoscopic examination shows some edematous reddening of the mucosa of the neck and trigone of the bladder, but no ulcers. The wound healed rapidly, and she has regained her strength and color and about 25 lb. in weight.

Remarks.—In this patient the tuberculous changes in the kidney were more advanced than in Case I. Many different portions were involved, thus emphasizing the necessity of nephrectomy and the futility of a resection of the main focus, as a cure. The finding of the tubercle bacilli in the urine from the involved kidney on two occasions made the diagnosis an easier task than in Case I. Here again the bladder changes, at least when seen by the writer, were not at all typical and were not at all in proportion to her symptoms. The latter were predominantly vesical and only once did she have any kidney symptoms in the shape of a renal colic. The rapid improvement of her general condition after nephrectomy emphasized the great advantages of surgical over medical treatment in this disease. In spite of the removal of the involved kidney, the bladder symptoms have disappeared slowly, a clinical fact of great interest in these cases.

CASE III.—Diagnosis, tuberculosis of left kidney (pyonephrosis); nephrectomy in sixth month of pregnancy (Fig. 4).

Present illness began two years before admission to Michael Reese Hospital with increased frequency of and painful urination. She was obliged to get up five to seven times at night, and the quantity passed both by day and night seemed to her to be larger than she usually passed before onset of present illness. The increased frequency of micturition continued unaccompanied by other symptoms until three months before admission, when there appeared a painful and burning sensation upon urination and the urine became reddish, but she did not notice any blood until she passed two clots a week before admission. At about the same time as the painful micturition began, she experienced a 'throbbing ache' over the left side of abdomen just above the an-

terior superior spine of the ilium. She had become much weaker during the two years prior to her admission and lost about 50 lb. during that time. Her appetite was poor and her sleep was disturbed by the increased number of times that she was obliged to get up to urinate. Her family and personal history was negative. She was in the sixth month of pregnancy when first seen by the writer, the fundus being at the umbilicus. The left kidney was considerably enlarged and easily palpable. It was about the size of two adult fists and its surface quite smooth. Examination of the heart and lungs was negative, but she was quite pale. Her temperature was normal up to the time of operation. Cultures made from the urine were sterile. The white blood count was also normal. Cystoscopic examination showed edema of the left ureteral orifice and several small ulcers on that side of the trigone. Nephrectomy having been decided upon in spite of the advanced pregnancy, the kidney was exposed through the usual oblique incision and found to be about the size of a child's head at term. It was quite soft and markedly lobulated, and after stripping back the capsule one could see a number of miliary yellowish areas on the surface. The kidney was removed and found to contain about a pint of thin, yellowish pus under great tension; almost the entire parenchyma had been replaced by a number of cavities, nearly all of which communicated with the renal pelvis, and were filled with a caseous thick putty-like substance. When this was removed from some of the cavities, innumerable typical miliary tubercles were seen in the membrane lining the cavities, and in the parenchyma of the edges of many of the cavities one noted the presence of smaller cavities with the whitish-yellow, irregular, raised edges so typical of tuberculosis. There was a distinct but very thin margin of parenchyma along the middle and lower thirds of the kidney, but it had a lardy appearance, and scattered throughout it were a large number of millet seed to pea-sized tubercles which had not undergone caseation. The opening of the renal pelvis into the ureter was very small, barely admitting an ordinary probe, and at its very edge were a number of raised miliary tubercles. The ureter walls were greatly thickened and the lumen quite narrow, so that evidently there had been considerable obstruction to the escape of the contents of the renal pelvis, which explained the large quantity of pus under great tension found when the kidney was first opened. The tuberculous pyonephrosis, although not completely shut off from the lower urinary tract, had only been able to empty its pus and urinary secretions imperfectly, which accounted for the pain over the kidney before operation.

Remarks.—It is of great interest to note that a nephrectomy performed during the latter period of pregnancy had no effect either upon mother or child. The diagnosis of an enlargement of the kidney was easily to be made by palpation, and although not typical in any way, yet the absence of the ordinary organisms which produce kidney infection led one to suspect a tuberculous process. The extensive destruction of the kidney emphasizes the necessity of an early diagnosis before there is danger of a possible involvement of the opposite kidney by an ascending infection. The bladder symptom of increased desire to urinate was the most prominent one and was very slow in disappearing even after removal of the kidney.

CASE IV.—Closed tuberculous pyonephrosis. Secondary general miliary tuberculosis (Fig. 5).

Female, *æt.* fifty, was first seen by Dr. M. A. Nix, of Princeton, Illinois, to whom the writer is indebted for the report of the case and the instructive specimens obtained at autopsy. Her most prominent symptoms, when seen

by Dr. Nix in consultation, were marked dyspnea, cyanosis and vomiting. This continued for about three weeks, when she died. Her urine during this period contained much albumin, a few hyaline and granular casts, but very little pus. She had never shown any signs either of renal or vesical disease. The specimens were chiefly of interest because the patient evidently had had an advanced tuberculous pyonephrosis of the left kidney for a number of years, the entire parenchyma being replaced by a number of cavities separated by fibrous septa and containing a thick, whitish, caseous pus. There were no traces of a communication of the renal pelvis with the ureter, so that this was a typical example of a closed pyonephrosis so frequently occurring in renal tuberculosis and due to an early cicatricial closure of the ureter close to the renal pelvis. The kidney was reduced to a mere shell containing the putty-like substance in imperfectly separated cavities, the lining membrane of which still showed tubercles. The opposite kidney was quite small and showed a firm granular surface on stripping off its capsule and a firm cut surface on section,—all the usual findings of a chronic interstitial nephritis. The renal pelvis showed a smooth mucous membrane, but the entire parenchyma was studded uniformly with miliary tubercles scattered throughout both the cortex and medulla. The autopsy findings corresponded accurately with the clinical history. The absence of pus in the urine in spite of the advanced left-sided pyonephrosis is easily explained by the absence of communication between the renal pelvis and the ureter. The casts and albumin are due to the end stages of the chronic nephritis of the opposite kidney, and finally the high fever, cyanosis and dyspnea are typical of a generalized miliary tuberculosis which had its origin no doubt in the left-sided tuberculous kidney.

Remarks.—No better argument could be obtained for the early removal of a tuberculous kidney, unless there are strong contraindications such as involvement of the opposite organ, extensive foci elsewhere, or a very poor condition of the patient. The kidney which had been the seat of a closed tuberculous pyonephrosis had undergone the same changes as when a so-called spontaneous cure occurs. A process of autonephrectomy had taken place, the entire parenchyma was gradually destroyed, and the only traces of a kidney were the capsule and the septa between the cavities, which had replaced the secreting tissue. That in spite of this apparent cure there were active bacilli, is made probable by the invasion of the entire body by miliary tubercles. The opposite kidney was studded with these evidences of a generalized invasion and was also the seat of a chronic nephritis. When its burden was increased, it was unable to carry it, and a uremia resulted.

CASE V.—Closed tuberculous pyonephrosis; obscure symptoms (Fig. 6).

The patient, a woman, *æt.* twenty-four, was admitted to the writer's service at the Michael Reese Hospital on March 31st, 1913, with the following history. Three months before admission she began to have a dull, aching pain in the left lumbar region which radiated down to the gluteal region. The attacks of pain were accompanied by a sensation of chilliness followed by fever and profuse perspiration. There were no bladder symptoms, and she had not passed any blood during the attacks. She had lost considerably in weight and strength during the last year. The urine contained many leucocytes and red blood cells. No tubercle bacilli were found, and a cystoscopic examination made upon admission showed the left ureteral orifice inflamed and deformed and the left half of the trigone inflamed, while the right half of the bladder and right ureteral orifice were normal. It was impossible to catheterize the



Fig. 1.—External view of early stage of tuberculosis of the kidney. Note upper pole studded with miliary tubercles.

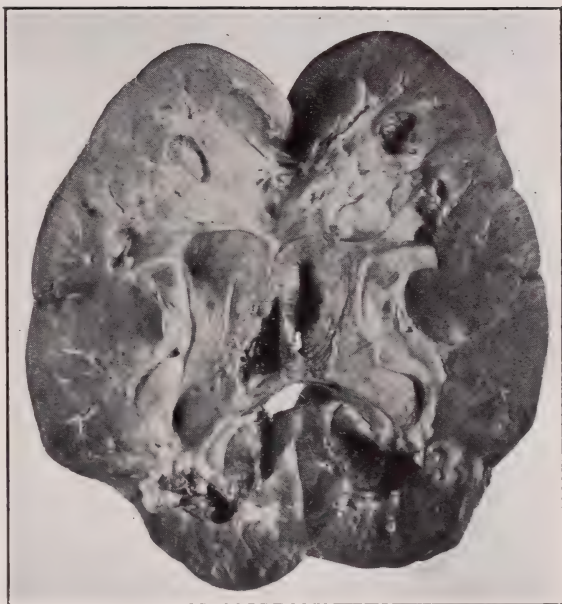


Fig. 3.—Tuberculosis of kidney at an early stage. Note the cavity formation at upper pole and adjacent thereto several typical caseating foci. Also note large tubercle just above cavity, seen on left half of picture. Also note miliary tubercles in pelvis of kidney and around cavity in upper pole in both halves of kidney.



Fig. 2.—Sectional view of early stage of tuberculosis of the kidney. Note how lower pole of kidney is studded with miliary tubercles.



Fig. 4.—Advanced stage of tuberculosis of kidney. Note how early changes are most marked at apices of papillae and how, at upper pole, foci have coalesced to form layer cavities, leaving only a shell of kidney tissue.



Fig. 5.—Two kidneys from autopsy of case of generalized miliary tuberculosis. Kidney of one side (right one of illustration) showed closed tuberculous pyonephrosis, while opposite kidney showed advanced interstitial changes and miliary tubercles. Generalized miliary condition due to unilateral tuberculous pyonephrosis.



Fig. 6.—Tuberculosis of kidney complicated by colon bacillus infection. Note the typical cavity formation due to tuberculosis of upper half of kidney. Chief symptoms in this case were those of a perinephritic abscess with high fever and tenderness over kidney, and rigidity of adjacent abdominal muscles. After perinephritic abscess had been drained, temperature still continued, and exploration of kidney showed condition in picture. Nephrectomy. Prompt recovery.

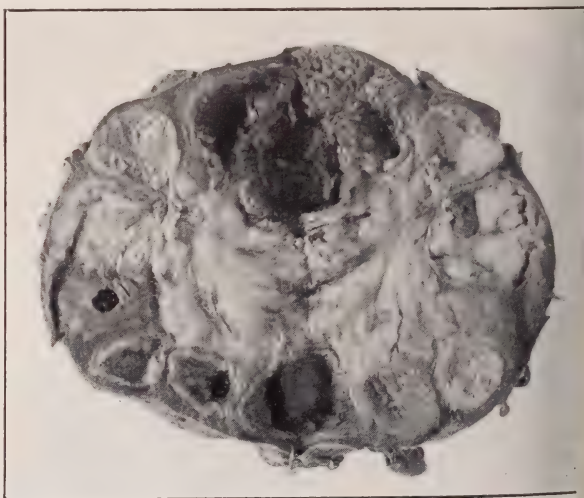


Fig. 7.—Tuberculous pyonephrosis. Note how kidney tissue is replaced by large caseous cavities. In this case there was little if any communication between the caseous foci and the renal pelvis. (Closed tuberculous pyonephrosis.)

left ureter. Although we suspected the presence of a left-sided renal tuberculosis, we did not deem our evidence sufficient to warrant an operation. A few weeks later one could palpate a distinct enlargement of the left kidney, and on May 4th, 1913 (about four months after admission), she had a severe chill followed by a rise in temperature to 104° F., accompanied by a white blood count of 25,000 and severe pain in the left lumbar region. The left kidney was distinctly enlarged and tender during this attack. On the two following days she had similar chills followed by high fever. For the next ten days she had a slight evening rise (101° F.), but no chills. The urine contained no pus. The enlarged left kidney was now quite easily palpable. Radiographic examination was also negative. The left kidney was exposed at operation and found to be very large with a markedly lobulated surface, each lobule being quite soft and fluctuating. The ureter was quite rigid and considerably larger than normal. After removal, the kidney (Fig. 6) showed the reason why the diagnosis had been so difficult. The entire parenchyma had been replaced by a series of cavities lined by a distinct thick membrane and filled with a thick, putty-like caseous debris. There was only a thin rim of parenchyma around the cavities. The renal pelvis was greatly dilated and filled with the same material as the cavities. The ureteral opening into the pelvis was closed, so that there had been no escape of contents into the ureter from the renal pelvis for some time. We were confronted with a closed tuberculous pyonephrosis. The absence of any communication between the upper and lower urinary tract explained why we had been unable upon four occasions to find tubercle bacilli. The renal pain, so prominent a feature in the history, was no doubt due to retention of secretion, and the attack of chills, fever and sweats was without doubt due to a secondary infection with other organisms like the colon or pyogenic cocci. The presence of bladder changes, even though not characteristic of tuberculosis, limited to the vicinity of the left ureter, should have been sufficient evidence to warrant an earlier exploration even in the presence of a negative search for tubercle bacilli. The enlargement of the kidney and the onset of symptoms of mixed infection in reality were the immediate cause for operative interference. This case illustrates the difficulty of diagnosis in closed tuberculous infections of the kidney.

Remarks.—The obscurity of the symptoms in this patient illustrates how difficult it is to recognize a tuberculous pyonephrosis, in which there is little if any communication between the kidney and lower urinary tract. The early cystoscopic findings—namely, marked unilateral edema of the ureteral orifice and bladder trigone, should have aroused our suspicion more strongly than they did of the presence of some infective renal process. The kidney symptoms (dull, aching pain) with a negative x-ray led us to believe that a renal infection was present, but the absence of any pyuria was very deceptive. When the kidney became distinctly enlarged and chills and fever appeared, we felt that an exploration was justifiable, and found that the pyonephrosis, which had greatly simulated the variety due to pyogenic organisms, was in reality due to the tubercle bacillus. This case has many points in common with the next one of true mixed infection.

CASE VI.—Male, *æt.* twenty-nine; tuberculosis of kidney (mixed tubercle and colon bacillus infection); perinephritic abscess (Fig. 7).

This patient was admitted to the writer's service in the Michael Reese Hospital, August 27th, 1912, with a history of having become weaker during the preceding three weeks. During the same period he had a number of chills,

followed by high fever, and sweats accompanied by severe pains over the left kidney radiating into the abdomen but not downwards. The patient had noticed pus in his urine but no blood. Prior to the onset of the present illness he had enjoyed good health, the onset of the symptoms being very sudden. Examination upon admission to the hospital showed that the right half of the abdomen was quite soft, but beginning at the middle line and extending to the ileocostal space there was marked rigidity and exquisite tenderness over the entire left half of the abdomen as far as the median line of the back. The rigidity and tenderness were most marked over the left ileocostal space. The white blood count was 22,400. The urine contained a large number of pus cells. No cystoscopic examination nor search for tubercle bacilli was made. A diagnosis of a perinephritic abscess was made and confirmed at the first operation. Around the lower pole of the kidney was an abscess cavity containing about 8 oz. of thick, yellow pus. Palpation of this lower pole revealed but little enlargement of the lower half of the kidney, the surface being perfectly smooth. Much to the writer's surprise, the drainage of this perinephritic abscess gave only transitory relief. The temperature continued to be high and there was evidences of a general septic intoxication. The patient was again anesthetized, and the wound reopened ten days later. There was no retention of pus present, but one could feel that the upper half of the kidney was greatly enlarged and studded with many superficial abscesses, many of which were opened while the kidney was being delivered into the incision. The kidney was removed, and only after opening it was the diagnosis of tuberculosis made and confirmed later by microscopical examination. A glance at Fig. 7 will serve to aid the description of our findings. The upper half of the kidney was double the size of the lower half. One could not recognize the ordinary division into cortex and medulla, the entire parenchyma being replaced by a large number of abscess cavities from 1 to 2 cm. in diameter. Many of these contained thin, yellow pus, while others were filled with thick, caseous material, and the walls of these cavities showed the yellow-white irregular eroded edges so typical of tuberculosis of the kidney. Microscopically one could see that the parenchyma had been almost completely replaced by granulation tissue containing many miliary abscesses and foci of caseation. The wound healed rapidly and the pus disappeared from the urine. The temperature fell immediately after removal of the kidney, and the patient regained his strength and increased greatly in weight and has remained well for the past eighteen months.

Remarks.—It is a well-known clinical fact that a kidney tuberculosis may remain latent for a long time and suddenly manifest its presence when a perinephritic abscess appears, as in this case. The infection was never suspected to be due to any other form of organism than the colon bacillus or pyogenic cocci until after the removal of the kidney. The secondary pyogenic infection had completely masked the underlying tuberculous one. Drainage of the perinephritic abscess was only of temporary benefit, and the persistence of symptoms of septic intoxication necessitated removal of the kidney. The fact that the tuberculous infection took place via the hematogenous route is shown by the comparative absence of changes in the renal pelvis and the marked involvement of the upper pole of the kidney proper. The predominance of febrile and renal symptoms completely outweighed any bladder disturbances, emphasizing again the great variation in the clinical pictures under which renal tuberculosis appears.

LUPUS AND THE LUPOIDS.

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It will undoubtedly be a wise and helpful procedure to group together and describe all those diseases of the skin that are directly or conjecturally dependent on tuberculosis. As lupus is the type of cutaneous tuberculosis, we have given it titular prominence, classifying as lupoids all affections germane thereto, or even related by suspicion. Codification is of immense advantage in approaching a subject of this sort, whereof the components are scattered throughout the literature under so many different designations. If the seeker for knowledge can acquire a comprehensive grasp of this pathological syntagma, it will be easy for him to recognize the different elements as they appear, modified by the accidents that have determined many variations. In order to render the discussion clearer, we will include as lupoids even those diseases whose tubercular pathology is disputed, realizing that the injection of exceptions serves mainly to create confusion. After the mind has absorbed the proposition as a whole, it will be simple and safe to undertake the refinements of etiological dialectics. It is a matter of common observation among dermatologists that practitioners, as a rule, falter constantly in the recognition of the tuberculoses of the skin, and analogous disorders. Recalling the turgescient terminology this is not remarkable. When every observer added a title peculiar to the language in which he wrote, obscurity was inevitable. It is the purpose of this paper to put the ax to this preposterous genealogical tree, and reduce things to the logical basis of common cause or similar clinical history. Let us not forget that certain points which we are about to take for granted are still in dispute; but, for the sake of clearness to the uninitiated, we will overlook the finer distinctions.

Lupus is a neoplasm. It is an infective granuloma. An infective granuloma is a round-cell infiltration caused by an infective agent. The infective agent in lupus is the tubercle bacillus. The invasion begins in the deep part of the corium. The lesion takes the form of a little nodule, consisting of a fibrous reticulum crowded with round cells. The skin structures over the nodule are healthy in recent cases. Gradually the cells in the centre of the nodule increase so much in number that the vascular supply is cut off, fatty degeneration ensues, and the nodule is absorbed or ulcerates. In

either case scarring results. Sometimes the papillary element predominates and we have a verrucous character to the growth seen in tuberculosis verrucosa cutis or warty lupus. Infiltration, disintegration, with or without superficial ulceration, but always with scarring, are typical of lupus and the lupoids. Lupus nearly always begins on the face of a child. Note attentively that it does not occur on the scalp. Freakish exceptions are barred by convention. It is so distinctively a disease of childhood, that age is a strong differential point in a difficult diagnosis between it and some resembling lesion in an adult. There may be one or several patches; generally one. The color is dull red. If multiple, the spots may be as small as pinheads, gradually coalescing into patches of variable size but of the same appearance. These are distinctly raised, somewhat elastic centrally, but more rigid peripherally. If pressure is made with a glass spatula the color cannot be squeezed out of them. Being neoplasms they show in the skin, after all the blood has been expressed, as little yellow spots called apple-jelly nodules. They bear a superficial resemblance to freckles seen through the glass. These resisting yellow spots are pathognomonic of lupus vulgaris.

The progress of lupus vulgaris is usually slow, and the destruction of tissue proportionately slight. Sometimes, however, it assails regions where progress is faster (for example, the nose) and here destruction of tissue is apt to be considerable, because in the neighborhood of mucous membranes it frequently assumes the ulcerative type. The whole thickness of the nose may be eaten through, and even the cartilages destroyed. Lupus never affects bone directly, although in the sloughing of the other tissues of the nose the bones may be involved in secondary infection. The scars left by lupus ulcerations are tough and fibrous, those left by the subepidermic absorption of lupus nodules are atrophic. Note the character of this scar left after lupus ulceration. It helps to distinguish post-factum lupus from lues. Where the destruction of the nose is less complete you will find, after recession of the process, a peculiarly pinched appearance of the organ with sharp grisly edges caused by the contraction of the tough cicatricial tissue. Near the eye, ectropion is apt to follow. When the angle of the mouth is affected, the disease is pretty certain to invade the mucous membrane, producing ulcerations of the lips, cheeks, gums, and hard palate. It does not affect the bone of the palate, however; only the soft part. In the mouth papillomatous lesions are sometimes observed. The tongue is rarely involved, the larynx occasionally. The limbs, especially about the knees, elbows and buttocks, are sometimes the primary seat of the disease. Like the scalp, the neck, genitals, palms and soles escape.

Lupus vulgaris is much more common in females than males. The ratio is variously put at from two to one, to four to one. It begins in childhood as we have already sought to emphasize. It

rarely begins after puberty. The preponderance of cases in women and children, and the avoidance of the hairy regions like the scalp, nape of the neck, and genitals, would suggest the thought that except in virulent cases, the hair is in some way an impediment to its growth.

The duration is of many years. Unless influenced by treatment, it will steadily encroach, with central scarring, sometimes with the reappearance of active foci right in the middle of the area already traversed. This tendency to reappear in the scar distinguishes it from lues which never goes over the same ground twice.

The tubercle bacillus is found in the lesions, and inoculation produces tuberculosis in the guinea-pig. Sabouraud is of the opinion that all the cases originate in the nasal mucous membrane, and thence invade the face.

Tuberculosis verrucosa cutis, or warty lupus, involves the back of the hand as a rule, and its location is ascribed by some to the habit, acquired by many consumptives, of wiping the mouth with the back of the hand after coughing. The causation usually given is contact with animals dead or alive, such as is had by butchers, cooks, coachmen, doctors, pathologists, and dissecting-room attendants. There is a reddened patch covered with a warty crust. The red base extends like a narrow frame around the excrescent papillæ. Occasionally a little pus can be squeezed from beneath the crusts. It is an indolent lesion with little or no subjective disturbance. Anatomic tubercle or verruca necrogenica is of the same character and origin but of smaller size. There is a good deal of uncertainty regarding the etiological connivance of the tuberculous diathesis in the production of lupus vulgaris. It would seem that the tuberculous subject should be most susceptible to the local manifestations of his disease. Yet the facts do not bear this out. Let the general practitioner stop and consider how many times he has seen lupus in frankly tuberculous individuals. Let the dermatologist stop and consider how many times he has seen lupus in individuals otherwise healthy, lacking both diathesis and tuberculous history. Illustrations to the contrary can be cited, of course, but the evidence is so conflicting that the incidence of lupus in those of a tuberculous predisposition might fairly be ascribed to coincidence. No one denies the etiological activity of the tubercle bacillus, but the question of the occurrence of lupus, exclusively or mainly in those with a tuberculous tendency, is still *sub judice*.

Lupus erythematosus is a lupoid. It is not a real lupus. There is no nodular infiltration as in lupus vulgaris. No tubercle bacilli have been found. It is not inoculable. It is an inflammatory disease, in which the cellular elements undergo fatty degeneration, and lead to atrophic scarring. It was once regarded as an aggravated form of seborrhea, and entitled seborrhea congestiva. The weight of opinion to-day is that it is a tuberculide, that is a disease

produced by the toxins of the bacilli, and not directly by the bacilli themselves. It occurs in reddened patches with scanty, closely adherent scales and atrophy. The atrophy can be detected, in the midst of the inflammatory area, as small, whitish depressions. The favorite location is the face, especially the nose and cheeks adjoining, where it sometimes takes a form, resembling, in the perfervid imagination of its delineators, a bat or a butterfly. Hence it is called the bat wing or butterfly disease. Patches may occur elsewhere on the cheeks, also on the forehead, on the rim and in the concha of the ear and on the scalp. Recall now the point emphasized in describing lupus vulgaris—namely, that it never occurs on the scalp. Erythematous lupus may occur on any part of the body, but aside from the situations already mentioned shows a predilection for the back of the fingers and toes. Here it resembles chilblains and has received the name of lupus pernio, an altogether unnecessary addition to an overburdened terminology. Lupus erythematosus is distinguished from lupus vulgaris by the age of the patient (never occurring in the very young), by the absence of the apple-jelly nodules when pressure is made with the diascop, by the presence of markedly adherent but scanty scales and atrophic scarring. (The scar of lupus vulgaris is apt to be tough and fibrous.) On removing these scales, they are found to send prolongations down into little pits, corresponding to dilated sebaceous gland ducts. The age of the patients is from eighteen to forty-five. Lupus vulgaris in a patient between these extremes would give a history of having existed from childhood. Erythema induratum is a tuberculous disease affecting the backs of the lower legs, and characterized by the appearance in the skin of sluggish, purplish nodules as large sometimes as hickory nuts. These eventuate in ulceration or the molecular disintegration that leaves a depressed scar. The diagnosis is readily made by the location, color and indolent course of the infiltration. It is a true tuberculosis and is classed as a lupoid for convenience of description. It is also styled Bazin's disease. Scrofuloderma is a term applied to the pouting ulcerations produced by the discharging of caseous glands and carious bone. They are perfectly familiar and are included here only to complete the record.

Tuberculosis cutis orificialis is the extension of visceral disease to the integument contiguous to the natural outlets, or the inoculation of the same by contaminated discharges. There are developed one or more superficial, roundish, indolent ulcerations, generally covered with a thin crust. This condition is rare and when it does occur shows a marked preference for the anus. The mouth is sometimes affected but not as frequently as the anus. This is a little peculiar when we consider the countless bacilli ejected through the mouth, and rubbed into the surrounding skin by careless victims. Perhaps the presence of fistula in ano is responsible for the preponderance of the disease in that locality.

Acne scrofulosorum is a lupoid usually denominated a tuberculide. A tuberculide is a step-brother to a tuberculosis. As already mentioned it is caused not by the bacillus but by the toxin of the bacillus. Its genesis would suggest the shot in billiards called the carom. You aim not at the ball you wish to pocket but at another, by the rebound from which you expect to strike the first. In a tuberculide the bacillus does not strike the tissues itself, but secretes a toxin which does the damage for it. All tuberculous diseases arising in that roundabout way are indexed as tuberculides. To simplify the nomenclature, and with no intention whatever of questioning the accepted pathology, they are discussed in this paper under the title of lupoids.

Acne scrofulosorum differs from the other lupoids in the absence of scarring. But as it occurs only in strumous children the etiological association is obvious. The eruption consists of small pustules scattered over the buttocks and thighs.

Acne varioliformis, disguised under various aliases such as *acne atrophica*, *acne frontalis*, lupoid acne, *acne necrotica*, and *acne à cicatrices déprimées* may be taken as the type of the remaining lupoids which are really only modifications of it brought about by differences in location or other accidental circumstances. The description of one is therefore a description of all. Along the hair line across the forehead, in front of the ears, and on the ears, will be found acneiform papules that leave a depressed scar. They are also likely to invade the scalp. There is nothing distinctive about them except the terminal scarring. They are infective granulomata just like their Brobdingnagian relatives, lupus, lupus erythematosus and erythema induratum.

Acnitis, which might be styled an *acne varioliformis* of the rest of the face, has been smothered under a number of appellations more or less satisfactory to their authors but utterly bewildering to the average practitioner. Of these the writer will mention *acne agminata*, disseminated follicular lupus, and small pustular scrofuloderm.

Folliclis, which is *acne varioliformis* of the extremities, has received a baptism not of water but of hail, for it has been hailed by more resounding titles than any other disease of like importance. We will take a few at random—*acrodermatitis pustulosa hiemalis*, lupus erythémateux disséminée, *hidradenitis destruens suppurativa*, folliculites disséminées symétriques à tendance cicatricielle, *spiradenitis suppurativa disséminata*, scrofulides nodulaires disséminées, folliculitis exulcerans, tuberculides acneiformes et nécrotiques, and many more examples.

It will certainly be a work of exceeding great merit to trim the exuberance of that appalling verbiage. If this paper served no other purpose it should deserve the commendation of the perplexed practitioner. We will put the ax to the root and ruthlessly cut

away everything but 'lupus' and 'lupoid.' In these two words we shall have enough to convey our meaning clearly. Lupus shall represent the typical cutaneous tuberculosis and the lupoids analogous diseases related to lupus by similarity of structure or by identity of origin. Whether the bacillus acts directly on the skin or through the medium of its toxins, does not alter the essential fact that in the last analysis it is the efficient cause of both. So wherever on the body (scalp, face, or limbs) you discover a lesion resembling an acne papule (or even a lesion of larger size) with a pustular top that terminates in a depressed scar, do not hunt around for a name suggested by its location, its resemblance to some other pathological condition, or any accidental circumstance whatever; just style it a lupoid, and you will have diagnosed it with scientific accuracy and will be prepared to treat it successfully.

The differential diagnosis between these tubercular affections and dermatoses of a similar appearance is usually made without much difficulty. If the characteristic features of lupus are present, its identification is easy. Circumscribed reddened patches in a child showing apple-jelly nodules through the glass compressor lead inevitably to the right conclusion. Similar patches with scarring, in an adult, will give a history of having existed since childhood. If the patches, *læsi morbi*, begin later in life, then it may be necessary to eliminate syphilis as a conflicting factor. The Wassermann reaction, history of infection, tell-tale scars in other situations, the snail-like progress of the tubercular condition, are all valuable aids in resolving the doubt.

Tuberculosis verrucosa cutis bears a close resemblance to blastomycosis. Some expert dermatologists give sundry subtle differences between them, which are extremely difficult to grasp. For example, the edge of one patch will be a deeper red or violet than the other, will be a little more infiltrated or infinitesimally wider, or one disease will have a tendency to develop into a slightly larger area. With a blastomycosis and a tuberculosis verrucosa cutis placed side by side these distinctions might appear, but when the concrete example of the one is contrasted with the mental picture of the other, the determination rests often upon the fervor of the imagination. Concomitant cachexia may assist in proving a tuberculosis. The habitat of the patient may suggest a blastomycosis, since this disease is infrequent in the East. This is not to be depended upon, however, as tuberculosis is not infrequent in the West. When all is said and done, the microscope will probably have to be brought into action for the differentiation. The finding of the yeast fungus is definitive.

Occasionally lues comes in conflict with this form of tuberculosis. The distinction is easily made if all the circumstances are carefully considered. Lues travels faster, ulcerates centrally, is painless, and, as noted above, may be substantiated by the history of infec-

tion, suggestive scars, and perhaps by other active symptoms. Lues is always apt to take the horseshoe form instead of the complete circle, in its tertiary manifestations. If it be a gumma, the difference will be obvious. If it be a tubercular ulcerating syphilide, the periphery will be composed of distinct papules or tubercles with ulcerating summits, and will not present the frame-like rim of warty lupus. The word tubercular, used in reference to the luetic lesions, has to do entirely with their size and shape and not at all with their origin. If doubt still lingers the Wassermann test may remove it. But remember that the Wassermann reaction is negative in a large percentage of tertiary cases.

Attention to the peculiar features of lupus erythematosus will prevent its being mistaken for any other condition. Red patches, scanty but tightly adherent scales, specks or small splotches of atrophy and gaping sebaceous follicles make a coercive combination.

Erythema induratum is readily recognized by its restriction to or preponderance on the calf, by its dull, red, sluggish nodules and the concomitant cachexia.

Acne scrofulosorum is a pretty rare manifestation of the tuberculous diathesis and need hardly be an element of confusion.

Lichen scrofulosorum is another *rara avis*; in fact, it is a rarer *avis* than the preceding and is supposed to be an admixture of it and lichen. It is not a lichen at all. It also occurs only in cachectic children. It is not worth while to disturb the harmony of our progress by making a detour to discuss it.

Acne varioliformis, acnitis, and folliclis are not likely to be confused with anything except a tertiary syphilide. The suggestions for distinguishing lupus from lues will be of service here. An additional clue is furnished by the tendency of tertiary lues to be unilateral.

The treatment of lupus resolves itself into an effort to build up the nutrition of the patient and destroy the deposits in the skin. The former is directed along the usual lines. Cod-liver oil if well borne is decidedly serviceable. It may be supplemented by the hypophosphites and the bitter tonics. Therapeutic 'gluttony' or the urging of the consumption of food in excess of the apparent needs of the patient, will, if combined with reasonable exercise, and sufficient sleep in a ventilated room, so activate his resistance as to lessen the progress of the disease and enhance the effect of local measures.

Local measures consist in destructive agents. Lupus is a neoplasm and will not yield without violence. This may be directed through the chemical rays of the Finsen light; through a modification known as the Kromeyer light; through the cautious application of the Roentgen ray; through the employment of various chemical caustics such as arsenic, acid nitrate of mercury, salicylic acid and

carbolic acid. When the spots are small and scattered, pure ichthyol will often bring about surprising resolution. A plaster of creosote and salicylic acid each in the proportion of 20 per cent. possesses many advantages. The points of attack are the nodules. If these are destroyed, the surrounding inflammatory zone will disappear. A favorite method a few years ago was the boring of the nodules with a toothpick dipped in pure carbolic acid. This is an excellent plan of attack, and is thoroughly effective. Of the other means mentioned above, the *x*-ray, with much to recommend it, is open to the objection that carcinoma sometimes follows in its wake. The Finsen light is probably the most efficient agent thus far devised, especially in its cosmetic results, but it is a tedious long-drawn out performance to apply it properly, and it is not available except in a large institution, handling a goodly number of cases. As lupus is rather rare in this country, it will not become a popular remedy. The Kromeyer light, being easier of application and as certain of action, will be the method of election here.

For tuberculosis verrucosa cutis, or warty lupus, salicylic acid plaster in 20 per cent. strength will prove decidedly effective. Lupus erythematosus, being an inflammatory disease as well as a neoplasm, is more amenable to treatment. It is strange in view of its accepted as well as its discarded pathology—that the treatment for seborrhea frequently removes it. The lotio alba, consisting of potassium sulphuret and zinc sulphate in rose water, is always worth a trial. Failing this, the solid carbon dioxide will blanch the unsightly patch with the substitution of quite a presentable scar. X-ray also has its zealous advocates. Here, as in lupus vulgaris, the Kromeyer light has produced some brilliant results. One grain of iodoform administered in pill form three times a day appears to exercise a marked controlling effect in some cases.

Bazin's disease, or erythema induratum, will yield after a more or less protracted struggle to the measures indicated in the tuberculous cachexia. If the patient gains in general, he will gain in this particular. Acne and lichen scrofulosorum need not detain us a moment. Treat the dyscrasia.

Acnitis, folliclis, and acne varioloformis, the polyonymous expression of a single pathological entity, offer very little resistance to appropriate medication. This syndrome may be vanquished in two ways: either by the treatment for acne indurata, or by the treatment for tertiary syphilis. There is no pretence of a luetic element, and yet by a strange coincidence the antiluetic remedies produce positive results. The management of acne indurata consists of the management of acne simplex with an increase in the strength of the applications. Lotio alba with its solid ingredients doubled or trebled, or even quadrupled, usually acts more speedily than in ordinary acne. The internal management is the same. In the writer's experience, it has been rather uncommon to find these pa-

tients exhibiting any other evidences of the tubercular diathesis. In a previous paper was quoted the statement of a physician connected with a prominent tuberculosis sanatorium in New York state to the effect that the so-called tuberculides were so unusual in that institution that he was unfamiliar with their manifestations. As a rule, therefore, you will not be called upon to prescribe for systemic tuberculosis. Tone up if necessary. Otherwise treat as for acne.

To facilitate the making of a correct diagnosis, by sweeping away an absurd redundancy of terms, combining conditions unprofitably split by subtle distinctions, and collecting into one comprehensive group all the varied manifestations of a common cause, was the purpose underlying the production of this paper. To focus attention more closely upon the relationship between these much-betitled dermatoses, to impress more firmly the identity of their etiology, to fix them more clearly in the mind's eye as all of a piece, and differing only by circumstance, was the reason for selecting the title—lupus and the lupoids.

TUBERCULOSIS OF THE EAR.

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Tuberculosis of the ear is an extremely rare condition, particularly in its primary form. As a rule it is secondary to a tuberculosis of the lungs, but is seldom met with as a complication of tuberculosis of any other part of the body.

Tuberculosis of the external ear, particularly of the auricle, although exceedingly rare, may occur in the form of a lupus, but the site of preference of this condition is usually around the tip of the nose.

Tuberculosis of the middle ear and its complications will merely be considered here. It is a far more common condition than is usually supposed. The infection in the lungs may be quiescent, and the first evidence that the patient has tuberculosis may be a discharge of thick caseous material from the ear, which occurs through a rupture in the drum.

The source of infection in these cases, the same as in all other cases of infection of the middle ear, is from the nasopharynx through the Eustachian tube, and very often, particularly in children, this may be associated with hypertrophied tonsils and enlarged glands of the neck. Politzer has observed, repeatedly, the occurrence of tubercular glands of the neck following attacks of scarlet fever in children resulting in tuberculosis of the ear. According to Heike, in infants with aural tuberculosis, the surrounding glands and lymphatics are frequently involved and destruction of the bone takes place very early. Border estimates that the majority of discharging ears in children are tuberculous in origin although this is questionable.

Since the investigation of the origin of tubercular glands of the neck from tubercular tonsils, we must seriously take into consideration the effect of this origin on the ear. In cases where a persistent discharge from the ear continues, and large tonsils are present, it would be advisable to investigate the possibility of this discharge being tubercular. The removal of diseased tonsils associated with discharge from the ear often clears up the ear condition very rapidly, but there is a large number of cases in which the discharge still persists, and it is this class of cases which may show tuberculosis.

Tuberculosis may be acute or chronic. The acute condition

almost always is due to infection through the Eustachian tube, manifesting itself by the sudden appearance of a discharge from the ear through a perforation which has occurred painlessly. Multiple perforations may be present, and at times tubercles may be seen on the drum. Destruction occurs very rapidly. The ossicles become loosened so that the least touch with an applicator or the forceps will result in their dislodgement. The mucosa of the middle ear becomes involved, and at times minute tubercles may be seen on the promontory. These cases develop complications very rapidly, particularly labyrinthitis and tubercular meningitis.

The chronic form may only take place after a chronic suppuration of the ordinary character that has gone on for some time. In such cases, destruction although slower is positive and pieces of necrotic bone may often be removed. The sequestra if examined microscopically will give evidence of tuberculosis. Politzer reports one case of tuberculosis of the inner wall of the tympanic cavity of a woman, thirty-six years of age, who died of pulmonary tuberculosis, and who had suffered for four months from a profuse suppuration of the middle ear, which proved to be tuberculous in origin. Blake and Buck consider that the occurrence of a perforation with infiltration and destruction of the posterosuperior quadrant of the membrane, unaccompanied by pain, seems to be a characteristic symptom of a beginning ear tuberculosis.

The exact diagnosis of the condition, however, can only be made by a laboratory examination. It is seldom that the tubercle bacillus itself is found in the discharge, and a positive diagnosis can only be ascertained by the injection of some of the discharge into a guinea-pig. Besides this, portions of membrane and sequestra of bone may also be examined microscopically.

Milligan draws the following conclusions:—

(a) A final and exact diagnosis is imperative both from the point of view of prognosis and of treatment.

(b) The disease is most frequently found as secondary to a tuberculous process in other regions of the body.

(c) Primary tuberculous disease of the middle ear is probably of more frequent occurrence than is usually supposed.

(d) The prognosis is always grave, but in a certain proportion of cases, suitably planned, surgical intervention will eradicate the disease.

(e) In many cases it is advisable to conduct the treatment in stages.

(f) When less than 10 per cent. of the hearing power remains, no attempt should be made to preserve the ear as an organ of sense.

(g) When more than 10 per cent. of the hearing power remains in a patient otherwise in apparent health, a definite attempt should be made to preserve the remaining hearing power.

(h) When the tuberculous origin of the ear disease has been scientifically demonstrated, the case should be regarded as infectious and precautions taken accordingly.

The prognosis in all cases of middle ear tuberculosis is exceedingly grave. If the patient does not die of the primary infection in the lungs, he is likely to succumb to one of the complications resulting from the ear condition. Ordinary cleanliness is absolutely necessary, and careful watch must be maintained to note the amount of destruction that is going on and to treat surgically the areas of necrosis as they occur. When the disease begins to invade the mastoid process, the most painstaking radical operation must be performed. Every focus of infection must be removed. Of course, such an operation as this can only be done in those individuals in whom the tuberculosis of the lungs is in the quiescent stage.

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ORIGINAL ARTICLES.

TUBERCULOSIS OF THE LIVER.

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Tuberculosis of the liver occurring in the course of general acute miliary tuberculosis, or secondary to tuberculosis of the intestines or abdominal lymphatic glands, is by no means uncommon. In some cases also the liver seems to be the only or the most extensive site of tuberculosis in the body. In spite of the frequency with which tuberculosis occurs in the liver, its pathology as well as the symptoms produced have been in recent years only very meagerly discussed. Indeed, although this condition may produce a fairly definite clinical picture, yet the diagnosis is generally confused and the true condition is only revealed at autopsy.

When the liver is involved in a tuberculous process sufficiently extensive to cause symptoms referable to the liver, it is generally the result of infection from some old tuberculous ulcer in the intestines, or from some tuberculous mesenteric gland. The liver may be found crowded with miliary tubercles, and in such cases the organ is generally considerably enlarged, often very markedly so. It is remarkable to what extent tuberculosis may develop in the liver with little or no involvement of the other organs. The spleen also usually shares in this tuberculous process and may be crowded with miliary tubercles and considerably enlarged. In cases which survive for a longer time, the tuberculous nodules tend to enlarge and become confluent. Only rarely, however, are any large caseous masses produced. Usually, even in the more chronic cases, the liver, even though it may become very considerably enlarged, maintains its contour, and presents no irregularities on the surface that could be palpated through the abdominal wall.

It is particularly in those cases where the tuberculous process is chiefly located in the liver that the diagnosis is most difficult and most often mistaken. In such cases as have been reported, and in the writer's own limited series of cases which have come to autopsy, the patients have almost uniformly complained as their earliest symptom of a dull, aching, more or less continuous deep-seated pain in the epigastrium. This pain is not influenced by the

ingestion of food. The abdomen is slightly rigid and slightly tender on deep palpation in every area, but particularly over the upper part. When tuberculosis extensively involves the liver, jaundice eventually is apt to occur sooner or later, and may become very intense.

The disease may run a very rapid course, as in one of the writer's cases, where, after a few days, a dull pain in the epigastrium and intermittent fever were complained of, jaundice set in and rapidly became very intense. In this case the liver soon became greatly enlarged and the patient died in about four weeks. In other cases it may be much more chronic. Jaundice may only be a terminal event and may only be slight; also, however, it may be very intense and persist for a long time. In another of the writer's cases, which at autopsy showed the liver enormously enlarged and crowded with caseous tuberculous masses, there was very deep jaundice for about four months, and in this case it was more marked at intervals. Before jaundice is produced there must be a very extensive involvement of the liver, and when it occurs it naturally means a fatal termination sooner or later. Only rarely is life prolonged later than two or three months after jaundice sets in, death usually occurring after about three or four weeks.

The stools are usually fairly well colored. Ascites occurs only rarely. The temperature is usually typically tuberculous, being markedly intermittent in character and rising in the afternoons or evenings. The patients emaciate rapidly. As is usual in tuberculous cases the blood count shows a slight leucopenia and a relative lymphocytosis. The spleen is usually also affected and may become considerably enlarged, a point of some diagnostic importance.

Such symptoms as these cases present, particularly the abdominal tenderness, temperature, and jaundice are diagnosed very often, at least in the early stages, as cholecystitis, cirrhosis of the liver, pylephlebitis, typhoid fever, or endocarditis. On account of the enlargement of the liver which so often occurs, amebic abscess of the liver or even secondary carcinoma are also taken into consideration in the diagnosis.

The relation of tuberculosis of the liver to cirrhosis has been much discussed. It seems certain that the cirrhotic liver is more than ordinarily susceptible to the development of tuberculosis. In most of the reported cases of extensive tuberculosis of the liver and such cases as the writer has seen at autopsy, there has been no co-existing cirrhosis.

Cases of tuberculosis of the liver may be of very varied duration, some cases having a very rapid course, others becoming very chronic and showing signs of marked liver insufficiency lasting many months. In some cases there are present no marked signs referable to the liver, yet in others there is a very definite clinical picture which ought to be, but very often is not, recognized.

ALCOHOL INJECTIONS IN TUBERCULOSIS OF THE LARYNX.

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This report covers all the cases in which injection of the superior laryngeal nerve with alcohol was resorted to during a period of eleven months of sanatorium practice. The cases were not selected because of the manifestation of any definite and similar pathological lesions, and the report admirably illustrates the practicability of this form of treatment. In most of the cases the injection was resorted to for the purpose of relieving the pain, although the attendant salutary effect of increasing the ease with which food could be taken was so marked that it must rank with the former in importance.

Boulay¹ has called attention to this form of anesthesia for the performance of intralaryngeal operations, such as cauterization.

In 1909 Hofman, of Munich, reported 16 cases in which he had injected the superior laryngeal nerve and in which the anesthesia lasted from six to twenty days. Alexandre² has described 3 cases of extremely painful involvement of the larynx in tuberculosis where his injection caused complete relief of pain, lasting in one case for a period of two months. Mithoefer³ has called attention to the fact that it is chiefly in the form of disease with great involvement of the superior orifice of the larynx—the aryteno-epiglottic type—that alcohol injections have been found of great service. Involvements of the external surface of the epiglottis, however, will not be relieved by such injection, since this portion is innervated by the glossopharyngeus, while the internal surface is innervated by the superior laryngeal nerve, coming from the vagus. In extensive involvements of the epiglottis, amputation is advised.

The technique of the operation is simple and is as follows: Place the patient in a horizontal position. The left side of the larynx is grasped with the first and second fingers of the right hand and with the thumb of the same hand the painful spot is located. As soon as this spot is found, the thumb-nail is pressed in to mark the spot and the needle is introduced at this point. This painful spot is the point where the internal branch of the superior laryngeal nerve pierces the thyrohyoid membrane. It is situated at about the middle point of the superior border of the thyroid cartilage. The needle is introduced perpendicularly to the surface of the skin for a distance

of 1.5 cm., which distance has been marked off on the needle. According to the thinness of the subcutaneous layer of fat the perforation has to be more or less deep. The point of the needle is now moved carefully in all directions until a sharp pain radiating to the ear is felt. Sufficient warm 85 per cent. alcohol is slowly injected until the pain in the ear disappears. During the operation the patient has to avoid both speaking and swallowing. The needle is then withdrawn and the process is repeated on the other side. No local anesthetic is required. A few minutes after the operation the patients complain of very little discomfort. In case the nerve has not been reached the discomfort is increased, but the pain on swallowing is markedly diminished.

CASE I.—Mrs. W. Late third stage case. Complained of continuous racking pain in throat which was so intense that she had refused nourishment for several days. Laryngeal examination revealed ulceration and erosion of entire right half of epiglottis, deep ulceration of cords and arytenoids. Both superior laryngeal nerves were injected, and after twenty-four hours patient took first meal. Still complained of some pain on swallowing which was relieved by orthoform applications on epiglottis. The pain in larynx was completely relieved within forty-eight hours. Ten days later patient began to have pains in larynx which became severe at end of five days. Reinjected on seventeenth day. Complete anesthesia lasting until death of patient on twenty-ninth day.

CASE II.—Miss G. Late third stage case. Complained of dysphagia and pain in throat of two months' duration. Laryngeal examination revealed epiglottis clear, slight ulceration at cord. Infiltration of arytenoids. Injected both superior laryngeal nerves with complete relief of symptoms. Anesthesia lasted twenty-one days until death.

CASE III.—W. Late third stage case. Complained of severe pain in throat; dysphagia. Aphonic. Laryngeal examination revealed epiglottis clear, extensive and deep ulceration of cords and arytenoids. Injected both superior laryngeal nerves three times, the anesthesia lasting fourteen, nineteen, and twenty-four days.

CASE IV.—Early third stage case. Complained of pain in throat, dysphagia, and pain in neck. Laryngeal examination revealed thickening of epiglottis, extensive ulceration of cords and arytenoids. Was injected four times at intervals of twenty-four, thirty-three and forty-two days. Partial relief of dysphagia and pain in throat. Pain in neck unaffected. Supposed involvement of lower larynx and upper trachea.

CASE V.—G. Late third stage case. Complained of severe pain in throat. Aphonic. Laryngeal examination revealed marked thickening of epiglottis; view of larynx obstructed. Injected both nerves twice. The first injection partially relieved the pain; five days later reinjected, complete anesthesia lasting nineteen days.

The ease with which this form of treatment is employed, and the marked relief which it affords in suitable cases, renders it one of the most gratifying agents at our command to relieve the pain of the tuberculous.

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SOME NOTES CONCERNING TUBERCULOSIS AND THE LONDON CHILD.

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Kipling has written that there are "nine and sixty ways of constructing tribal lays, And every single one of them is right!" From how many different points of view the stupendous subject of tuberculosis and the child may be approached, and in each instance with profit, I would not care to surmise; but it is only possible, within the compass of these notes, to touch lightly, allusively, and perhaps discursively, upon some of the questionings given rise to by constant observation of a considerable number of London children of the poorer classes.

Even so, what we call surgical tuberculosis must, for the nonce, be put on one side. I write but as a physician—like Copenhagen at the battle of Waterloo, God's humbler instrument, and fully conscious of my 'meaner clay.'

Twenty years or so ago we were taught, and firmly believed, that, if the clinical picture of tuberculosis in the child differs from that of tuberculosis in the adult, it is because "the disease affects children and adults differently." No suspicion crossed our minds that, in dealing with the tuberculosis of the adult, we might be dealing with a later stage of the tuberculosis of the child; and we did not doubt that such apical infiltration constituted early phthisis (and which the more scientific of us were only then beginning to designate 'incipient chronic pulmonary tuberculosis') was other than the result of a not very long antecedent infection of the apex by inhaled bacilli.

A few persons, it is true, did still hold some notions about constitutional predisposition diathesis, scrofula, and even about pre-tuberculous phthisis, but they were generally reckoned, by the advanced, odd fish, and of no particular account.

Mais, nous avons changé tout cela; and, while the work of Behring and Roemer has forced on our unwilling minds the conception that the chronic phthisis of adult life is, in the majority of cases, due to the recrudescence of an infection contracted in earlier days, and long slumbering in the tracheo-bronchial glands, Hamburger has drawn our attention to the analogy between the drawn-out course of tuberculosis and that of syphilis. Analogies are dangerous allies; but, let it be remembered that in clinical leprosy, as

Babés has shown, we are really only dealing with the tertiary stage of a long-established infection. So also, both with visceral gummata and with the grey granulations of phthisis. But further: just as we have lately learned to appreciate the fact that what we used to call parasyphilis is but the expression, after many years, of a local tissue hypersensitiveness to the poisons of a very chronic residual infection; so did the late Prof. Poncet seek to instill the notion that many of the 'banal' inflammations and scleroses of adult life are connected, etiologically, with earlier invasion by Koch's bacillus. Nor should mention be deferred of the long-continued and patient clinical observations of Landouzy, on the essentially 'tuberculous' nature of certain serous inflammations, certain septiciemias, and oftentimes of such cutaneous manifestations as erythema nodosum.

Our conception of tuberculosis has therefore been widely extended of late years; and, though the use of Hamburger's analogy with syphilis does not exclude us from belief that, in the case of tuberculosis, repeated infection may be sustained subsequently to the time of the first successful onslaught, still, we all recognize that the aphorism "the child is the father of the man" is never more apt than when applied to the case of the tuberculous infant. Indeed, with as much truth as can ever lie in a paradox, it may be said that the heredity of tuberculosis is best seen in this transmission from child to adult.

Now it is beyond dispute that a true conception of the relation between the Child and the Man is of paramount importance in waging what we call the Fight against Tuberculosis. Important as is the immediate loss of life from tuberculosis in childhood, great as is the sum of childish misery caused by the disease, and imperative as is the fulfilment of our duty to the little ones, yet how infinitely more cogent appears, to those who are more busy about the race than with individuals, our plea for better care of the children, when, as now, we can insist that the only true means of protecting the race lies in the production of a sufficient immunity, general or specific, in childhood, and in the maintenance of an adequate standard of health and nutrition throughout life! So that, in considering the problems of the tuberculosis of childhood, we have to do not only with the appalling aggregate of sickness and loss occurring amongst London school-children, so graphically described and so carefully estimated by Dr. Letitia Fairfield (*School Hygiene*, 1912), but with origins of the chronic phthisis that fills our infirmaries, and burdens the resources of our hospitals and sanatoria.

The first and second acts of the tragedy of tuberculosis are played in youth, and it is those who work amongst the poorer children who really witness the rise of the curtain. Though an exaggeration, it is perhaps not utterly extravagant to say that the tu-

bercle bacillus is a normal parasite of the lymphatic glands, or of some group or groups of them, in town-dwelling children of the poorer classes; and it is certainly true that the normal result of infection by Koch's bacillus of the poorer town-bred child of school age is the establishment of a *modus vivendi* between certain lymphatic glands and the parasitic organism.

Infection of the nursling has, as a rule, other consequences; primary infection of the adult, or of the young adolescent runs a diverse course. But, in the school-child, it is along the frontier marked by the lymphatic blockhouses that the battle is waged and the invaders are held in check. If the line of defence is penetrated, catastrophe is imminent and the balanced superiority of the host to the parasite is lost. And it is on the recognition of this great fact that along the line of the lymphatic glands, defence in childhood is best established (in this case of the tubercle bacillus) that it is necessary for us to concentrate our attention. In the adult, as Cobbett has shown (*Proc. Roy. Soc. Medicine*, 1912), the frontier is pushed forward, as it were, and the mucous membranes are defended from the smaller and scattered masses of lymphoid tissue that in adults are possibly better developed than in the child. In the very young child, and in the nursling, however, the stopping power of the lymphatic glands themselves seems but feeble; and the consequences of infection are disastrous in the extreme. But our present concern is with the school-child; and several questions have at once to be faced. Whence come the infecting organisms? What is the usual point of attack? What circumstances favor the access to the lymphatic glands of these organisms? What, if any, are the special characteristics of those children who suffer invasion by them most readily?

Unfortunately, as is too often the case, clinical observation has been greatly hampered, of late years, by the eagerness wherewith preconceived opinions as to the relative frequency of infection, from bovine and from human sources, have been unheld.

Really, until the bacteriologists agree whether or no the human and bovine types of tubercle bacillus are immutable, they should not intervene in the clinical discussion.

For, if these types are immutable, how can we say whether Tommy Jones with tuberculous peritonitis and a 'bovine type of organism' has been infected from milk, or from some child or person himself the subject of bovine infection? And, if the types are not immutable, who can tell us under what conditions mutation takes place? Opinion seems to swing, in London, a little irresolutely; and we are rather as those who await some sign from heaven. On the whole, careful investigation seems to favor the notion that in the case of the youngest children commensal infection plays the greatest part; though for elder children with good family history, it is still fashionable to blame infected milk. But

are we quite sure that we know all that is to be known concerning the life-history of the tubercle bacillus outside the human body? I think not; and it is perhaps therefore more profitable to turn to some consideration of the 'point of attack.'

Tuberculosis, like syphilis, has its normal career, and its normal method of inception.

And the tuberculosis of normal childhood—the chronic infection of lymph-glands as seen amongst hospital out-patients—is predominantly an affair of the cervical, the tracheo-bronchial, or the mesenteric glands. In my own experience, the tuberculosis of childhood is, clinically, most often an affair of the tracheo-bronchial glands; next, of the mesenteric glands, and least frequently of those that are cervical. But inasmuch as enlargement of tracheo-bronchial glands is more easily and certainly detected than enlargement of those that are mesenteric, it may well be that a secondary mediastinal adenopathy is recognized before a primary enlargement of the mesenteric glands. So that, in any given case, the anamnesis counts for much. Still, on the whole, I would say that amongst children the tracheo-bronchial glands are usually those first affected. Cervical adenitis of undoubtedly tuberculous nature is, I am sure, far less common now than some years ago; and for reasons presently to be discussed. But how do the bacilli gain access to the glands? Surely there are three possibilities: (1) That of traumatic solution of continuity of surface layers; (2) that of alteration of the secretion and discharges from a mucous surface, causing diminished vitality of lining cells, allowing undue bacterial growth, and hence favoring symbiotic action; and finally (3), that of cryptogenic infection, the bacillus being carried in by wandering leucocytes.*

Putting the question a little differently, does the analogy with syphilis hold good, and is there a lesion at the site of infection? or is the lymphatic enlargement rather of the nature of a *bubon d'emblée*?

Quite recently Leroux** has insisted that, in the case of tracheo-bronchial adenopathy there is, in most cases, a *chancre tuberculeux* towards the base of the lung, or at the hilum, that heals, and becomes obsolete, as does any other chancre; but not until it has, in the words of Hutinel "*ensemencé les ganglions ou la maladie peut rester cantonnée.*"† This conception of a *chancre tuberculeux* is a fascinating one, and requires to be carefully examined; but I fancy that most clinicians would be inclined to declare that, in the ordinary course of things, tuberculous adenopathy, whether cervical, tracheo-bronchial, or mesenteric, is of the nature of a '*bubon d'emblée*'; and that, although traumatic breach of the surface may

*De Korte (*South African Med. Record*, September 28th, 1913).

***Archives de Méd. des Enfants*, September, 1913).

†*Le Progrès médical*, November 22nd, 1913.

play a part, there is not usually any marked reaction of appreciable duration at the actual site of infection, and that access to the lymphatic glands is generally made easier, for the tubercle bacillus, by unhealthy states of the mucosa, if not indeed brought about by the mechanism of cryptogenic infection.

Practically, what we have to recognize is this, that tuberculous cervical adenitis is very commonly preceded either by weak inflammatory reactions of the tonsils or adenoids, or by adenopathies associated with pediculosis capitis, or caries of the teeth. And it is, I am sure, because of the vastly greater attention given in London of late years to these so-called minor ailments of school-children, that we now see so much less tuberculous adenitis of the neck than we formerly did amongst them.

The tonsils and adenoids are 'taken out': the portals are not merely closed, but removed. Whether it is logical to do so, and whether or no the tonsils and adenoids have other functions to perform than those of allowing ingress, is another matter. Again, in the case of enlargement of the tracheo-bronchial glands or, at any rate, in those cases wherein the enlargement is primarily tracheo-bronchial, by far the most common history is one of precedent measles or whooping-cough—two diseases that are a frequent cause, in themselves, of mediastinal adenopathy.

It is indeed, I fancy, the familiarity of this sequence—measles, whooping-cough and tuberculosis—that gave many clinicians courage to insist on the accessibility of the pulmonary portal, even when the tide of fashion swelled, in accordance with Teutonic teachings, most strongly in favor of that which is abdominal.

Nevertheless, the importance of the abdominal portal must not be too lowly estimated.

Again, the question of a primary *chancre tuberculeux* arises, but it is obviously one almost impossible to be settled definitely. No doubt primary tuberculous ulceration of the small intestine is common enough in childhood; and Sir James Goodhart and Dr. Still state that of 132 cases in which, at the post-mortem examination, caseous mesenteric glands were found, no less than 102 presented tuberculous ulceration of the bowels. Nevertheless, clinical experience I think tends to uphold the notion that tuberculosis of mesenteric glands may frequently occur, sequentially to morbid intestinal conditions, but without precedent ulceration; and moreover, the surgeons are now demonstrating that such infection of these glands may take place, by way of the appendix, in exactly the same manner as may the cervical glands become invaded, via the tonsil, *i. e.*, without any obvious ulceration. But no one will deny that, just as measles and whooping-cough make smooth the path of entry to the tracheo-bronchial glands, so do the more or less commonplace intestinal catarrhs and disorders render the mesenteric lymph nodes accessible to the intrusion of the *B. tuberculosis*.

The fourth question, What are the special characteristics of those children who suffer, most readily, invasion of their lymphatic tissues by these bacilli? cannot be answered without reference to the famous 'types' of Sir William Jenner. 'Pretty scrofula,' and 'ugly scrofula,' as described by him, still stand for two opposed types easily to be recognized by those who have eyes to see. They seem, in the light of what we now know, to stand for two modes of reaction or of defence, in each case based on physiological 'constitution.'

The pretty, bright, delicate featured child, with neurotic cleverness and precocious intelligence—like little Eva of "Uncle Tom's Cabin"—is a child who resembles the adult in many ways, and not least in vascular and nervous physiology; for the normal child is less nervous, less sanguine, and more lymphatic.

Little Evas have in fact a poor line of lymphatic blockhouses; their defences are easily penetrated, and they tend rather to suffer from tuberculosis, of what is called the 'adult type' or to fall early victims to miliary infection.

But the 'ugly scrofula' type of child is one whose system, though allowing a certain amount of penetration, yet for one reason or another manifests a marked lymphatic reaction with a tendency to disease of bones and of mucous membranes.

It is perhaps worth while pointing out that due consideration of Sir William Jenner's classical descriptions involve our reckoning in each case, with (1) a particular mode of reaction to a definite invasion, and (2) certain morphological and physiological characters that go hand in hand with a tendency to a particular mode of reaction to such invasion by Koch's bacilli as may occur. There is the type of reaction, and the type of child who is prone to suffer such reaction.

Thus: fair hair, blue eyes, pink cheeks and a delicate hand do not indicate that infection has already taken place, but do suggest a lymphatic hypoplasia that is leaving the door ajar for the enemy.

Had this obvious point been kept in mind, we should have been spared much fine and sarcastic writing at the expense of those who are not ashamed to observe morphological types and physiological 'constitutions.'

Yet due recognition of such points is of no little assistance in diagnosis, and in prognosis.

These twin problems, full of inherent difficulties as they are, have not been made more easy by the facile habit of some practitioners, who with one breath discredit investigation by certain methods 'because every child is tuberculous—more or less,' and with the next ridicule another for 'diagnosing tuberculosis in every child he sees.'

Yet why should we be ashamed, or afraid to diagnose in the living child, what we find almost constantly in the post-mortem

room, and what we proclaim, in debate, to be almost universal amongst poor town-bred children?

It seems to me that, in some respects, the mothers at whom we have been a little wont to sneer, for always fearing 'consumption' or 'consumptive bowels,' are perhaps a little wiser than are we. They bring to us Tommy with a hacking cough, Susan with diarrhoea or Billy with lumps in his neck, and ask us, Is it consumption, Doctor? Surely they are wise in their questionings. We have hitherto been prone to wait until the curtain has fallen on the second act; but they want to know, and rightly, whether the cough, the diarrhoea or the lump marks the first act of the serious drama, or is but the *lever de rideau*—the protatic ailment.

The secret of treating the tuberculosis of children lies in the art of 'precocious diagnosis,' as the French say; or, in Lord Curzon's phrase, in intelligent anticipation of events before they occur.

To the accomplishment of this end, no line of investigation should be omitted. Even the most obstinate adherent to the notion that the tuberculosis of childhood is, in the majority of cases, a milk-borne infection cannot ignore the relevancy of an enquiry into the family history; and those who are inclined to belittle the importance of constitutional predisposition will not deny that, too often, the evidence is clear that an infant has been the subject of commensal contamination.

What has been said as to the frequent antecedence of such illnesses as measles and whooping-cough carries with it justification for always obtaining in anamnesis the fullest information as to the occurrence of any protatic illness, especially if followed by a dragging convalescence; and we should not fail to note if such a special idiosyncrasy, such as marked aversion to fat, has been remarked by the mother.

Anemia, irregular fever, a dry and repetitive cough of 'mediastinal' character, are all indications of recognized import, and wasting is of considerable significance, if an established fact. But mothers are apt to confound the normal loss of infantile chubbiness, especially in boys, with actual cachetic loss. Nevertheless, this physiological loss of fat may be carried too far, and it then implies at least a state of vulnerability to tuberculous invasion, and is moreover, not infrequently accompanied by a dangerous demineralization of the system. Fats and minerals are the nutritive and chemical bases of defence against Koch's bacillus.

Much as we have learnt from the systematic application of the von Pirquet test in the past, its practical usefulness is, at present, far from being enthusiastically acclaimed, even in the form of its quantitative modification; and I do not think that, in London, the subcutaneous tuberculin test has even been, in the case of children, really approved. Nor do we use very frequently the method of complement deviation, associated with the name of Arloing, ex-

cept in special cases; so that, on the whole, it must be said that the tendency is for reliance to be placed rather on a judicious review of all the clinical evidence available than on special procedures. Of course, the finding of bacilli in sputa, and the albumin reaction are of the highest value in cases with expectoration. But our aim is to diagnose tuberculosis, long before, if ever, extrusion of the bacilli or breaking down of the pulmonary parenchyma occurs.

One simple test that has lately come into some vogue may prove to have some definite value. I refer to that recommended by Moriz Weisz in his *Thèse de Doctorat* (Paris, November, 1912). It was devised as an outcome of some enquiry into the significance of Ehrlich's diazo reaction, and consists just in this, that the dropping of a little weak solution of permanganate of potash into the urine of a tuberculous patient produces (certainly if the infection be at all serious) an orange coloration that is easily recognized. But it is too soon to speak quite confidently of its exact importance.

There is little occasion to discuss at any length the diagnosis, by ordinary methods of physical examination, either of tuberculous cervical adenitis, or of *tabes mesenterica*; but it is impossible to avoid consideration of the case of the tracheo-bronchial glands. Nowadays, radiography must be accounted as necessary as inspection, palpation, auscultation, and percussion, but still opinions differ as to its relative value. Perhaps the greatest service that the radiographers have rendered to clinical medicine lies in this, that they have given faint-hearted physicians courage to rely on those slighter indications, afforded by percussion and auscultation, which formerly were somewhat discredited as evidence of glandular enlargement.

Doubtless this topic is discussed by experts, in this issue of the JOURNAL, but I would refer for judicious exposition of a difficult subject, in addition to the paper by Leroux already cited, to others in the *Gazette des Hôpitaux*, June 17th, 1913, and in the *Annali dell' Istituto Maragliano*, Vol. III, 1912.

When all is said and done, however, when due consideration has been given to the value of Smith's sign, to the presence of minute varices on one side or other of the vertebral column, to Schick's phenomenon, to Valsalva's sign, and to other indicia, the greatest import attaches to two findings—(1) the results of light percussion and (2) the abnormal presence of whispering pectoriloquy—as affording safe ground for concluding that there is sensible enlargement of the tracheo-bronchial glands.

For the due appreciation of these it is necessary to remember that the results of light percussion, or rather of lightest percussion, and the limits within which whispering pectoriloquy are normally heard, vary at different ages.

These points have been adequately discussed so recently—by

Leroux, M. P. van Pée,* Cozzolino,** Zabel,† and by Nicola††—that there is no occasion to traverse the ground again. Only this need be said, that none but the very lightest percussion, as taught by Dr. Maguire at Brompton, twenty years ago, is of real value. Probably the 'topographical percussion' both of von Krœnig and of Goldscheider really depends for significance on this fact.

But one curious detail is important. When 'lightest percussion' is practised, the perceptions that are compared by the brain of the examiner are not simply based on auditory sensations but are complexes in which tactile elements play their part. We used, at the time I spoke of just now, to recognize this, but we did not realize what Pottenger has shown, and what Pomeroy so lucidly expounded in the JOURNAL last year, that the sense of increased resistance felt is not merely due to the deeper pathological changes, but to muscle rigidity, reflexly produced. Personally, I hold that the most unequivocal results are, in the class of case to which reference is now being made, usually obtained by examination of the interscapular space, and of the apices behind. Percussion of the apices in front, and of the regions above the clavicle, in the absence of posterior dulness, may lead, in the child, to a diagnosis of pulmonary tuberculosis when there is but apical insufficiency due to inspiratory defect, as from nasal obstruction, or what not. And, even when there are definite indications of enlargement of tracheo-bronchial glands, it is only right to remember that such deficiency in resonance as may be found anteriorly is not necessarily due to more than apical insufficiency or partial collapse, or loss of elasticity if you will, associated with the pressure of the glands on one or other bronchus. Such dulness may be quite variable, and is often deceptive. As Riviere says,‡ collapse goes ahead of infiltration. Dr. Lees, however, as those who have read his recent paper in the *British Journal of Children's Diseases*, December, 1913, must know, attaches great importance to the finding, anteriorly, of points of deficient resonance.

Direct percussion of the vertebral column, according to Korányi's method, is certainly of distinct value, each vertebra struck acting as an independent pleximeter, so that a definite sense of resistance is appreciated over each that is in contact with a mass of enlarged glands. But the production of d'Espine's sign, though having the same rationale as Korányi's method of percussion, is even more reliable.

If, in the normal child, the stethoscope is placed over the cervical spine, the breath sounds and the vocal resonance are found to be loudly transmitted; and, moreover, with a characteristic tracheal *timbre*. But, if there be swelling of the tracheo-bronchial glands,

**Presse Médicale*, August 21st, 1913.

***La Pediatria*, XX, 10.

†*Muench. med. Wochenschr.*, No. 49, 1912.

††*Gazz. degli Ospedale e delle Cliniche*, March 4th, 1913.

‡*British Med. Journ.*, August 30th, 1913.

the tracheal *timbre* and the markedly loud vocal resonance may be heard over the upper thoracic vertebræ, and, indeed, so low as the fifth. Sometimes the sign is better obtained if the words be whispered instead of spoken. But this must be remembered, that, as the child becomes older, the bifurcation of the trachea gradually comes to occupy a relatively lower position in the thorax, so that, although d'Espine's sign may be said to be present when the tracheophony or *chuchotement* is heard, below the level of the seventh cervical in young children, it is not so, in a child of eight, unless heard below the first or second dorsal; or, in a child of twelve, unless below the third or fourth. Similar considerations have to be borne in mind when discussing the value of whispering pectoriloquy heard to one or other side of the vertebral column. The positive value of d'Espine's sign is very great; but there is just this discount to be allowed for when it is negative, that should the glandular mass lie in front of the trachea, and not be interposed between it and the vertebral column, the characteristic phenomenon is not produced. It is necessary also to insist that the merely loud transmission of vocal resonance as heard over the normal lungs does not constitute d'Espine's sign; there must be the tracheal *timbre*.

That the immediate prognosis in the case of the usual tuberculosis of children is, as a rule, good—or, to speak otherwise, that the results of treatment are wonderfully satisfactory—may be admitted without any suggestion of 'over-diagnosis.' But there are of course many failures, and we must constantly be on our guard against undue optimism. Observation of the entire clinical picture should prove our best check of this tendency, and I would attach great importance to the observation of the many indicia, some of them perhaps too often neglected, that inform us whether or no the line of frontier defence is fully efficient, and whether or no the enemy is tending, here and there, to raid the territories that should be closely guarded. To this end we should watch carefully, not merely the general progress of the case, but the occurrence of sudden and erratic rises of temperature, of cutaneous manifestations, such as erythema nodosum, and of what the French call *poussées fluxionnaires*, *réactions banales*, and so forth. These intercurrent attacks and minor troubles—nay, even such things as repeated headaches—in children with glandular infection, are every whit as important as is the occurrence of general or even focal reaction, after the administration of tuberculin; and for the same reason.

Tuberculin therapy for children has, I believe, its vocation chiefly when the process of infection is very localized, very limited, and very well in hand. It is not often to be advised when the tracheo-bronchial glands are implicated, but is of service in some cases with cervical adenitis, and in a few of abdominal tuberculosis.

The surgeons are perhaps a little more enthusiastic, but, not uncommonly, we physicians have to deal with their aftermath.

And there is the less occasion for taking risks, since, as has been said, the results of old-fashioned treatment, directed by modern information and applied by a not over-cautious diagnostician, are so good, on the whole; that is, so far as the immediate future of the child is concerned.

Cod-liver oil holds its position as a sovereign remedy in spite of the depreciation it has undergone from the pens of many; but there is still scope for art and the application of experience in its exhibition. Personally, I think that a good emulsion combined with a fair proportion of minerals, in the shape of hypophosphites or lactophosphates, fulfils many indications, and, moreover, has the advantage that it forms an excellent vehicle for the exhibition of creosote, pushed to the very limits of tolerance; or of arsenic. Moreover, the addition of five or ten minims of castor oil to each dose of such an emulsion is of the greatest value whenever there is coincident, or consequent, disturbance of the bowel. If cod-liver oil really cannot be taken, the creosote may be given in capsules, and the minerals in tablets, or as 'Calcéose,' or Ferrière's 'Remineralisator.'

It is not easy to secure, for the poorer London child, when threatened with tuberculosis, a diet that is physiologically righteous; yet even the poorest, I find, will make a gallant effort, if patient instructions are given them. Bacon is getting dear, but a little pickled pork can usually be obtained, and eaten between bread. Dripping on bread is useful and fattening; and there are fairly cheap and nutritious articles of diet such as liver and tripe, far better for delicate children than a little frozen beef muscle. Tripe and liver are really substances containing 'internal secretions' or at least products of glandular activity, and it is a great pity that the poor, acting under stress of mistaken ideas, are forsaking the use of such wholesome articles in the endeavor to live like their social betters on, as I say, the frozen muscles of sheep and oxen. A practical point easily appreciated too is that cocoa is a food as well as a beverage, and the use of even a little cocoa with milk and water, is far better than the consumption of packet tea. Treacle is a natural and cheap food. It is, indeed, one of the most cheering part of one's work to see how, with the aid of an intelligent mother, if some practical advice is given on feeding, and some suitable medicine is exhibited, gradually the difficult corner is turned, and weight is gained, while physical signs and symptoms subside—even in cases that seem at first the least promising.

But then there are the others. There are those children who are of a family dragged down by the dead weight of a drunken father, or mother, or for whom a loss of work by, or ill-health of, the prime bread-winner spells a long time of privation.

Charitable organizations are many; the National Insurance Act is, by its inceptor, hoped to do very much to relieve the straitened

affairs of the poor man's household; nor should the work done by the Public Health Authorities, in respect of ameliorating the domiciliary conditions, whenever possible, within the limits of their jurisdiction, on receipt of notification, be omitted from the category of beneficent agencies, all working together for good. But there is one organization on which many of us rely as perhaps the most potent aid in the efficient treatment of early tuberculosis amongst children. I refer to that known as the Invalid Children's Aid Association. This invaluable Society acts as a kind of coordinator of other organizations; and its workings are such that, if a child attending clinic be, after examination by the attendant physician, specially recommended for treatment at a sanatorium, a convalescent home, or by what is known as boarding-out, speedily, and without delay, machinery is set in motion and the recommendation translated into being. In actual practice one finds the 'boarding-out' system productive of the very best results. Children who have lost weight steadily, and whose signs and symptoms have progressed, will, after two or three months sojourn in a suitable cottage, in an approved locality, come back wonderfully improved, and ready to gain advantage from medicinal treatment, until the occasion or opportunity offers for further stay in the country. I know no organization that is doing better work for the little ones, or whose methods and results deserve to be more widely known and more actively supported.

The lacunæ in these notes are only too many, and too obvious. But some of them at least are intentional. I have purposely made no reference to the peritoneal, the pleuritic, the meningeal, and the many other manifestations of tuberculosis met with in childhood, and, lamentably, seen so often, at our out-patient departments. For, even at the risk of appearing to exaggerate the importance of one aspect of a great problem, or series of problems, I have tried to insist on the prime necessity of recognizing, clinically, as well as pathologically, that the part played by the lymphatic glands in the defence against invasion by Koch's bacilli, is for children paramount.

The general practitioner should be encouraged to recognize early enlargement of the tracheo-bronchial glands with no lesser zest than he would apply to the diagnosis of the secondary symptoms of syphilis. It is certain that as many children suffer, at one time or another, from a lodgment of tubercle bacilli in this or that group of glands, as from measles, or from chicken-pox. That in many cases a recovery is accomplished, perhaps without other aid than a 'tonic and a holiday' does not relieve us from the duty of exercising the greatest care and circumspection in all cases where tuberculous infection may reasonably be diagnosed or suspected. The care of the child is the root-problem in dealing with tuberculosis. Let us kill 'the little foxes,' for it is they that spoil our vines.

TUBERCULOSIS IN IRELAND AND THE CRUSADE
AGAINST IT.

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the Honorary Physicians-in-Ordinary to H. M. the King in Ireland.

To a Special Number of the *Practitioner*, London, published in January, 1913, I contributed by request of the Editor an article on "Tuberculosis in Ireland." In that article I dealt with the subject under the following headings—History of Tuberculosis in Ireland, including Present Day Statistics; History of the Irish Crusade against Tuberculosis; Legislation against Tuberculosis, with Special Reference to the Tuberculosis Prevention (Ireland) Act, 1908, and its Failure, and also to the National Insurance Act, 1911, with its Provisions for Sanatorium Accommodation and the Administration of "Sanatorium Benefit"; and lastly, a Plea for the 'Home Treatment' of Tuberculosis.

The Literary Editor of the INTERSTATE MEDICAL JOURNAL has now paid me the compliment of asking me to contribute a similar original article to a special tuberculosis number of his JOURNAL—an article that would bring home to American readers the actual state of the disease in Ireland and what has been done to combat its ravages. I thank Dr. Philip Skrainka for his courtesy and will now do my best to justify the confidence he has reposed in me.

TUBERCULOSIS IN IRELAND DURING 1912.

It does not seem necessary for the avowed object of this paper to repeat all the facts relating to the history of Tuberculosis in Ireland. The reader will be content to learn the state of the case from the most recently published statistics, those relating to the year 1912.

In the *Forty-ninth (detailed) Annual Report* of the Registrar-General for Ireland, containing a general abstract of the number of marriages, births, and deaths registered in Ireland during the year 1912, Sir William John Thompson, M. D., F. R. C. P. I., states that, in the aggregate, the deaths from tuberculosis in the year named numbered 9,437, or 186 fewer than the number registered in the year 1911. The total is equivalent to 2.15 per 1,000 of the population of Ireland estimated to the middle of the year 1912, as compared with 2.20 per 1,000 in 1911.

From the year 1904, when the death-rate from tuberculosis was

2.9 per 1,000, the rate has fallen steadily. It declined to 2.7 in each of the years 1905, 1906, and 1907; to 2.6 in 1908; to 2.4 in 1909; to 2.3 in 1910; and, as already mentioned, from 2.2 in 1911 to 2.15 per 1,000 in 1912.

Of the 9,437 deaths registered as caused by tuberculosis in the whole of Ireland during the year 1912, 4,682 were of males and 4,755 were of females. In the province of Leinster, the deaths fell from 3,031 in 1911 to 2,965 in 1912—a decrease of 66. In the province of Munster, the deaths rose from 2,194 in 1911 to 2,204 in 1912—an increase of 10. In the province of Ulster, the deaths fell from 3,436 in 1911 to 3,343 in 1912—a decrease of 93. In the province of Connaught, the deaths fell from 962 in 1911 to 925 in 1912—a decrease of 37. The net decrease for the entire country is, therefore, 186, as already stated.

Notwithstanding these comparatively satisfactory figures, tuberculosis remained the second highest among the principal causes of death in 1912 as returned to the General Register Office by the District Registrars of Deaths throughout Ireland. It stood in between "Old Age" the highest, and "Heart Disease," the third highest cause of death during the year in question—the latest for which statistics are as yet available.

An examination of the sexes and age-periods of those dying of tuberculosis shows that the age-period which suffers most from tuberculosis mortality among either sex is that between twenty-five and thirty-five years—the death-rate for males being 3.4 per 1,000 of the number of males living at those ages, and the corresponding rate for females being 3.5 per 1,000. The age-period, twenty to twenty-five years, comes next with a death-rate of 3.2 per 1,000 for males and 3.3 per 1,000 for females. The lowest rates of all are to be found among persons aged seventy-five years and upwards—namely, 0.3 per 1,000 for males, and 0.2 per 1,000 for females.

These fateful figures illustrate the most heartrending feature in connection with tuberculosis—namely, its fatal incidence on those age-periods which are well described as the prime of life. It is in the age-periods from twenty to thirty-five years that tuberculosis in all its forms attacks and slays its victims in largest numbers. And so the flower of the manhood and womanhood of the country is cut down by the "Reaper whose Name is Death."

The following tabular statement, taken from the Annual Report of the Registrar-General for 1912, shows the total number of deaths from all forms of tubercular disease in Ireland for each of the years 1904-1912, with the death-rates per 1,000 of the population represented thereby, the decrease in the number of deaths as compared with the previous year, and the percentage of such decrease.

Table I.

<i>All Forms of Tuberculosis.</i>				
Year.	Total Number of Deaths.	Rate per 1000 of the Population.	Decrease.	
			Number.	Percentage.
1904	12,694	2.88	—	—
1905	11,882	2.70	812	6.4
1906	11,756	2.67	126	1.1
1907	11,679	2.66	77	0.7
1908	11,293	2.58	386	3.3
1909	10,594	2.41	699	6.2
1910	10,016	2.28	578	5.5
1911	9,623	2.20	393	3.9
1912	9,437	2.15	186	1.9

From this table it appears that the deaths from all forms of tuberculosis fell from 12,694 in 1904 to 9,437 in 1912—a very material falling off of 3,257 deaths between these years. This difference in the number of deaths represents a decrease of more than 25 per cent. in 1912 when compared with the year 1904. It is right to mention that the high death-rate of 1904—2.88 per 1,000 of the population—had previously been reached or very slightly exceeded (2.9) in the year 1880 (as a sequence probably of the very cold and wet seasons of 1878-1879), 1896 and 1897 (after the rigorous winter of 1895), and in 1900.

It will be interesting now to analyse and classify the 9,437 deaths from tuberculosis which were registered during 1912. Out of that number, 7,452 were grouped under the general heading 'pulmonary tuberculosis.' This was the phrase used in the medical certificate of the cause of death issued in 3,962 cases—the deceased being males in 2,015 instances and females in 1,947. To phthisis 3,026 deaths were attributed—males 1,422, females 1,604. From tuberculosis (not further defined) there were 207 deaths—of males 111, and of females 96. Acute phthisis slew 214—males 100, females 114. Acute miliary tuberculosis killed 43—males 23, females 20.

Passing away from the lungs, we find that the deaths from tuberculous meningitis were 637—males 347, females 290; from tabes mesenterica, 90—males 46, females 44; tuberculous peritonitis, 245—males 114, females 131; from other forms of abdominal tuberculosis, 152—males 74, females 78. Further, the deaths from tuberculosis of the vertebral column number 117—males 55, females 62. Tuberculosis of joints was fatal also in 117 instances—68 males, 49 females. To lupus, 12 deaths were referred—males 5 and females 7. Scrofula was held responsible for 11 deaths, tu-

berculosis of other organs for 153 deaths, and disseminated tuberculosis for 451 deaths—males 212, females 239.

The deaths in 1912 included under the general heading pulmonary tuberculosis, as we have seen, amounted to 7,452—males 3,671, females 3,781. These figures correspond to the following rates per 1,000 of the population—in general 1.70, male 1.68, female 1.72. In the year 1911, the total number of deaths from pulmonary tuberculosis had been 7,584—males 3,702, females 3,882. These figures correspond to the following death-rates—1.73, 1.70 and 1.77 respectively.

In the accompanying Table II, the deaths and death-rates from pulmonary tuberculosis in the year 1912 are presented by sexes and age-periods. This table shows that the highest death-rate from pulmonary tuberculosis among both males and females was between the ages of twenty-five and thirty-five years. In the case of both sexes taken together it was 3.13 per 1,000; for males taken alone it was 3.09 per 1,000; for females alone it was 3.17 per 1,000.

Table II.

Age Periods.	<i>Deaths from Pulmonary Tuberculosis in Ireland, 1912.</i>					
	Total of Both Sexes.		Males.		Females.	
	Number.	Rate per 1000.	Number.	Rate per 1000.	Number.	Rate per 1000.
0- 5 years	173	0.40	92	0.42	81	0.38
5-10 "	126	0.29	47	0.21	79	0.37
10-15 "	271	0.64	81	0.37	190	0.91
15-20 "	918	2.17	379	1.77	539	2.59
20-25 "	1091	2.90	546	2.86	545	2.95
25-35 "	1990	3.13	963	3.09	1027	3.17
35-45 "	1479	2.76	770	2.82	709	2.69
45-55 "	773	1.96	417	2.11	356	1.82
55-65 "	408	1.45	234	1.70	174	1.20
65-75 "	198	0.63	128	0.89	70	0.41
75 and upwards.	25	0.20	14	0.23	11	0.17
Total for all ages.....	7452	1.70	3671	1.68	3781	1.72

The age-period 20-25 comes next with a death-rate of 2.90 per 1,000 of the population at those ages, followed by the age-period 35-45, the deaths at which were equivalent to 2.76 per 1,000, while the deaths among persons of fifteen and under twenty years of age were represented by 2.17 per 1,000.

Taking the deaths from pulmonary tuberculosis among persons of fifteen and under forty-five years of age, numbering 5,478, it will be observed that they constitute nearly 74 per cent. of all the deaths from that disease.

From Table II it appears further that, while there is not much difference between the sexes in the total death-rate from pulmonary tuberculosis, in the earlier age-periods the female mortality is much greater than that of the male. This divergence is nearly

counterbalanced by a generally higher male mortality from the age of thirty-five years and onwards.

Perhaps indoor life of girls in childhood has much to say in bringing about a greater prevalence of consumption in them than in boys. And the exposure of adult males to wind and weather as well as their more dissolute habits, may stand as causes of their increased liability to the disease and its fatal termination.

Many years ago the late Dr. Thomas Wrigley Grimshaw, C. B., when Registrar-General for Ireland, arranged the population of the Dublin Registration Area, which includes the suburbs as well as the city itself, in the following four social classes: (1) the professional and independent class; (2) the middle class; (3) the artisan class and petty shopkeepers; and (4) the general service class, including domestic servants, soldiers, policemen, postmen, prison warders, coachmen and car drivers, vanmen, hawkers, porters, labourers and such like.

Sir William J. Thompson, the present Registrar-General, includes in his Annual Report for 1912, an interesting Table which gives information regarding the mortality from tuberculosis in that year among the several social classes above mentioned in the Dublin Registration Area, of which the population estimated to the middle of the year 1914 is 406,000. From that Table we learn that amongst the professional and independent class the death-rate from all forms of tuberculosis in 1912 was 0.41 per 1,000 of the inhabitants of the Area belonging to this class according to the Census of 1911; among the middle class the rate was 1.92 per 1,000; among the artisans and petty shopkeepers it was 2.94 per 1,000; and among the general service class, 3.16 per 1,000. Can any figures be more convincing as to the influence of social position for good or for evil on the mortality caused by tuberculosis?

THE CRUSADE AGAINST TUBERCULOSIS IN IRELAND.

From the year 1892, the subject of Tuberculosis: its Prevalence and Prevention, received attention at the hands of a voluntary body of citizens called the Dublin Sanitary Association both in its Annual Reports and in the Annual Addresses delivered by its successive presidents. A valuable report on the Prevention of Tuberculosis also forms Appendix I of the Report of the Council of the Association for the year ended December 31st, 1897. Recognizing the extreme importance of the matter the Council sent copies of that Report to all the urban and rural sanitary authorities of the country. It should be explained that for sanitary purposes, Ireland is divided into 96 urban and 215 rural districts.

Another important step was the founding of the Royal National Hospital for Consumption for Ireland in the open country near Newcastle, Co. Wicklow, in the year 1896. This institution was es-

tablished by voluntary contributions for the treatment of poor patients in the incipient and early stages of the pulmonary form of the disease. To its wards patients of both sexes are admitted from all parts of Ireland. There are at present over 100 beds and the accommodation is being still further extended. The normal length of stay in the hospital is ten weeks.

Thirdly, a branch of the then recently inaugurated National Association for the Prevention of Tuberculosis was established in Dublin in 1899. This branch did good service through many years in widely disseminating literature bearing on the infectiousness and dangers of tuberculosis and methods of prevention.

More recently, in 1907, Her Excellency the Countess of Aberdeen founded the "Women's National Health Association of Ireland," one of the great aims of which is to combat tuberculosis. Year by year this beneficent institution has been extending its sphere of usefulness by the establishment of Branches in all parts of the country. Its extensive organization has enabled it to render immense help to the antituberculosis campaign in Ireland, and quite recently its services have received official recognition. Under the provisions of Section 16 of the Finance Act, 1911, and of Section 64 of the National Insurance Act, 1911, a sum of £1,500,000 was made available for the purpose of the provision and upkeep of sanatoriums and other institutions for the treatment of tuberculosis. This sum was distributable among the constituent countries of the United Kingdom on the basis of population. The share accruing to Ireland was certified to be £145,623. The Women's National Health Association applied for a grant of £25,000 out of this sum, and this grant was recommended to the favorable consideration of the Local Government Board for Ireland by the Lords Commissioners of His Majesty's Treasury, with whom the final approval of such grants rests. It was therefore decided, on grounds of urgency, to entertain the Association's application. The subsequent operations of the Association have comprised the erection of a large sanatorium on the most modern and approved lines at Peamount near Lucan, in the County of Dublin, and the establishment of a smaller similar institution at Rossclare, County of Fermanagh. In each case the selection of the site was decided on by the Women's National Health Association, while the preparation of plans and the arrangement of the details of the schemes were carried out by the Association's technical advisers. A number of County Councils throughout Ireland have agreed, in preference to building sanatoriums of their own, to take permanent beds in the institutions of the Women's National Health Association.

The balance of the Sanatorium Grant, amounting to £120,000, will be allocated to the Councils of the various Counties (32 in number) and County Boroughs (6 in number—namely, Dublin, Belfast, Cork, Limerick, Londonderry and Waterford) on the basis of population,

to be expended in defraying the capital cost of sanatorium schemes to be approved by the Local Government Board.

Lady Aberdeen's personal and untiring efforts some years ago called into existence in Dublin the Collier Memorial Dispensary for Prevention of Tuberculosis and the Allan A. Ryan Home Hospital for Consumption—institutions which should possess a peculiar interest for citizens of the United States inasmuch as American funds enabled them to be established. These institutions have recently been taken over by the Corporation of the City of Dublin under the terms of the Sanatorium Sections of the National Insurance Act of 1911.

Several County Councils have schemes in hand for the erection of County Sanatoriums, but so far they have not fructified. Under the Tuberculosis Prevention (Ireland) Act, 1908, however, two sanatoriums have been established—one by the Dublin Joint Hospital Board at Crooksling, at an altitude of 950 ft. in the Dublin mountains; the other, Heatherside, at Streamhill, near Buttevant, Co. Cork, at an altitude of 450 ft. by the Cork Joint Hospital Board. The latter was the first county sanatorium opened in Ireland.

Besides these institutions the Corporation of Belfast have made an arrangement with the Forster Green Consumption Hospital for the use of thirty-five beds, with an option of any further beds which may be vacant. The Forster Green Hospital is situated on a western slope overlooking Belfast at an elevation of 200 feet above sea-level. The grounds embrace 40 acres, are well-wooded and contain sheltered walks and rest shelters.

The Belfast Board of Poor-Law Guardians have a fine institution—the Abbey Sanatorium—at Whiteabbey, Co. Antrim, about 5 miles from the City. It contains 265 beds, which are kept constantly occupied. It stands on a clay soil in 33 acres of gardens and pine-woods; 140 ft. above the sea.

In addition to the foregoing there are a few private sanatoriums for tuberculosis scattered over the country, but the available accommodation in them does not count for much in the attempt to cope with so widespread a disease.

Large numbers of tuberculous patients are cared for in the Workhouse Infirmarys throughout Ireland. In the year ended March 31st, 1913, the deaths from tuberculosis in all its forms in the Workhouses were 1,949, compared with 1,845 in the previous year (1911-1912) and with 1,916 in 1910-1911. In their Annual Report for 1912-1913, the Local Government Board point out that as the deaths from tuberculosis have decreased throughout the country, the increased number of deaths from the disease in Workhouses would apparently indicate that these institutions are now more availed of than formerly as places of isolation for cases in the advanced stage. Of the total 1,949 deaths, 1,588 were caused by the pulmonary form of the disease.

Lastly, in a few instances the County Councils have rented beds in General Hospitals or County Infirmaries for the reception of patients under the Sanatorium provisions of the National Insurance Act of 1911.

In the article in the *Practitioner*, January, 1913, I stated that the hospital treatment of tuberculosis is an anxious question, not easily solved. The requirements would seem to be:—

1. Consumption Hospitals or Sanatoriums in which the pulmonary form of the disease could be treated in its earlier and more hopeful stages.

2. Special isolated consumption wards in existing general hospitals into which tuberculosis, and that disease alone, should be received. Abundant air-space, with free access of air and sunshine, should be regarded as indispensable. At the Meath Hospital and County Dublin Infirmary of which I am one of the physicians, we have two such isolated wards.

3. Refuges for patients far advanced in, or dying of consumption. The German name for such an institution is very appropriate—*Friedensheim*, or Home of Peace. Dublin possesses three institutions of this sadly pathetic character—the Royal Hospital for Incurables, founded in 1740, standing in extensive grounds in the Pembroke township, a healthy suburb, Our Lady's Hospice for the Dying, at Harold's Cross, in the Rathmines township, another large and healthy suburb; and the Rest for the Dying, in the city itself.

4. Home Hospital Treatment, rendered possible under the provisions of the Tuberculosis Prevention (Ireland) Act, 1908, *if adopted* by any Sanitary Authority, with the *sanction* of the County Council concerned.

I have purposely italicized certain words in this last paragraph. The Tuberculosis Prevention (Ireland) Act, 1908, came into force on July 1st, 1909. Unfortunately, it is a permissive, not a compulsory measure so far as Part I of the Act is concerned, and to this is due the fact that in the fifth year after its enactment, its provisions have been adopted in only 22 out of the 96 urban districts and in only 28 out of the 215 rural districts, into which the whole of Ireland is divided for public health and local government purposes.

Part I of the Act deals with the notification of Tuberculosis and the disinfection of premises and articles likely to retain the infection of this fell disease. This part of the Act takes effect only in the districts of those sanitary authorities, whether urban or rural, which decide to adopt its provisions. In other words, it is left to the discretion of each sanitary authority to avail itself of the principle of compulsory notification of tuberculosis. The permissive nature of the first part of the Tuberculosis Prevention Act—the really essential portion of the measure—to my mind, dealt a fatal blow to its power as an effective preventive agency.

Furthermore, on June 3rd, 1909, the Local Government Board for Ireland, issued an 'Order' prescribing the forms and stages of tuberculosis to which, and the circumstances in which, Section 1 of the Act should apply. This 'Order' came into force on July 1st, 1909. It prescribed that this Section shall apply to the form of tuberculosis known as 'Tuberculosis of the Lung' at any stage at which the sputum discharged by the person suffering is, in the opinion of the medical practitioner attending on such person, liable to communicate the disease to other persons. So far so good, but it was further provided by the Order that the Section of the Act in question shall apply only in the following circumstances, that is to say, where the person suffering—

(1) Habitually sleeps or works in the same room as any other person or persons not so suffering; or (2) is employed or engaged in handling, preparing or distributing milk, meat, or any other article of human food intended for sale to the public.

This extreme limitation of the circumstances under which notification is to be made renders the procedure of little or no value for statistical purposes, or even for prevention of tuberculosis.

The Local Government Board themselves are evidently far from satisfied with the working of the Act. In their Annual Report for the year ended March 31st, 1913, the following stereotyped paragraph occurs at p. XXVII—"It is to be hoped that, before long, steps will be taken to introduce the compulsory notification of tuberculosis in all the larger urban districts. Such a course is especially desirable in the County Boroughs of Cork and Waterford, where the incidence of phthisis is particularly heavy." An identical paragraph was inserted in the Annual Reports of the Board for 1910 (p. XXXI), 1911 (p. XXXIX), and 1912 (p. XXXI). But, further, appended to this statement in each of the last four years is a summary of the notifications of tuberculosis in the County boroughs of Dublin and Belfast. The figures are instructive:—

Dublin County Borough.

October 1st, 1909, to March
31st, 1910.....=588.
Year ended March 31st, 1911=852.
Year ended March 31st, 1912=541.
Year ended March 31st, 1913=528.

Belfast County Borough.

November 2nd, 1909, to April
2nd, 1910.....=497.
Year ended March 31st, 1911=832.
Year ended March 31st, 1912=551.
Year ended March 31st, 1913=448.

And here are the comments of the Local Government Board on the figures of the last of these years (1912-1913):—

"The total number of notifications is, in the case of Dublin County Borough, approximately the same as in the previous year, but shows a substantial reduction in the case of Belfast County Borough. In both instances, however, the notifications fall short of the recorded deaths from pulmonary tuberculosis, and cannot therefore be regarded as affording a complete index of the incidence of the disease. In the interests alike of patients and of the general

community, it is important that notification should take place before the disease has reached an advanced stage, and it is to be hoped that Sanitary Authorities will bear this consideration in mind in connection with their administration of Part I of the Tuberculosis Prevention (Ireland) Act, 1908."

In their Annual Report for 1912-1913, the Local Government Board state that a very considerable amount of work has devolved on them consequent on the passing of the National Insurance Act of 1911. In order to meet the altered circumstances due to that event, it was found that the Tuberculosis Act of 1908 required to be amended. The Board accordingly had a short bill drafted with the object of facilitating the County Councils in making arrangements for the treatment of insured persons under the National Insurance Act. The opportunity was also taken to include provision for the compulsory notification of all cases of pulmonary tuberculosis. But the bill was opposed owing to the compulsory notification clauses, and these had to be deleted, as otherwise the bill would not have been passed.

The Local Government Board observe: "It is much to be regretted that compulsory notification of the disease had to be omitted, as it leaves this country (Ireland) in the unfortunate position of being the only portion of the United Kingdom where it is not in force, although the disease is more prevalent in Ireland, and consequently notification is more urgently required."

In advising the County Councils as to the procedure to be adopted for the preparation of county schemes for giving effect to sanatorium benefit under the National Insurance Act of 1911, the Local Government Board admit (Annual Report, 1912-1913, p. XXIX) that they experienced the difficulty that in Ireland there are no County Medical Officers of Health, to whom County Councils should look for guidance. This lamentable fact is altogether due to the action—or inaction—of the Board after the passing of the Public Health (Ireland) Act, 1878. Section 11 of that measure—the Sanitary Code for Ireland, as it might well be called—enacted, *inter alia*, that every "sanitary authority, whether urban or rural, shall appoint such other sanitary officers, including a Medical Superintendent Officer of Health when deemed necessary, as the Local Government Board shall in each case direct." And Section 12 of the same Act provides that the Board may, by provisional order on the application of the sanitary authorities of any sanitary districts, form a United District for any purpose of the Act. Here was the golden opportunity for the creation of County Medical Officers of Health, but it was allowed to go by default. The Board, therefore, have nobody but themselves to blame for the difficulty which has arisen more than thirty years after the passing of the Public Health Act of 1878, owing to the want of County Medical Officers of Health in Ireland.

Under Part II of the Tuberculosis Prevention (Ireland) Act, 1908, the duty devolved on the Local Government Board of prescribing the qualifications of Medical Superintendents of Hospitals—the term includes Sanatoriums—and Tuberculosis Dispensaries established by County Councils. Accordingly, the Board issued an 'Order' on July 19th, 1912, which, in brief, requires a period of at least six months' experience in the treatment of tuberculosis, gained either in a responsible position in a sanatorium or dispensary, or through a special course of training at an institution recognized by the Board as an efficient school for giving such instruction.

The approval of the Board is also required under Section 16 of the National Insurance Act, 1911, in regard to sanatoriums or other institutions with which Insurance Committees make arrangements for the reception of insured persons suffering from tuberculosis. In expressing approval the Board have stipulated that proper record of cases shall be kept, that the institution shall be open to their inspection at any time, and that they reserve the right to withdraw their approval whenever circumstances arise to warrant such a course. Intimation of the Board's approval is furnished in each case to the Insurance Commissioners.

The same Section (16) of the National Insurance Act permits Domiciliary Treatment—that is the treatment of tuberculous insured persons undertaken by individuals and local authorities otherwise than in sanatoriums and hospitals, or other institutions. Up to the present no general 'Order' has been issued in regard to 'Domiciliary Treatment,' but the various County Councils have been notified that the Board would require in each case—

- (1) The name of the person or local authority with whom it is proposed to make an arrangement under Section 16 (1) (b).

- (2) Copies of all medical reports received in regard to the case.

- (3) A statement showing the nature of the arrangements proposed including particulars of the medical attendance and supervision to be provided.

- (4) A statement showing the number of rooms in the house and the number of inmates therein.

We are informed in their last report that the particulars which have come before the Local Government Board in considering individual applications have fully justified this policy. In many instances it was found that domiciliary treatment of insured persons suffering from tuberculosis was about to be undertaken without any regard to the suitability of the patient's home surroundings, that there was not infrequently evidence of overcrowding, and that consequently the existing domestic arrangements afforded insufficient facilities for the isolation of the patient, or for a due measure of protection from infection for healthy members of the family. Many of the patients were shown to be in advanced stages of tuberculosis, which rendered the observation of precautionary measures all the

more important. The experience gained in regard to the domiciliary treatment of tuberculosis indicates the need for the provision of shelters as part of the equipment of the County Tuberculosis Dispensary.

In conclusion, I can only reiterate the views which I expressed in the article which I contributed to the *Practitioner*, in January, 1913—an article to which allusion has already been made. My conviction is that if the crusade against tuberculosis in Ireland is to succeed it must be conducted on the following lines:—

1. A compulsory extension of the principle of notification to all parts of the country and to all forms of the disease.
2. The appointment of whole-time County Medical Superintendent Officers of Health, independent of local influences and responsible only to the Irish Local Government Board.
3. An extension, and development as to numbers, of the system of district nurses.
4. The appointment of trained and qualified female sanitary inspectors throughout the country.
5. Full effect to be given to domiciliary medical attendance in all cases of tuberculosis for which accommodation cannot be found in hospitals, sanatoriums and such like institutions.
6. Perseverance in efforts which have been, and are being, made to instruct the people at large as to the rules of life which must be obeyed if the death-dealing poison of tuberculosis is to be resisted successfully.

To these essentials, I would add another—

7. What is of primary importance is, not that tuberculous patients should be sent to sanatoriums, and then allowed to return to insanitary homes reeking with disease, but that dwelling houses should be made wholesome and habitable. Then only will the hygienic lessons learned by the patient while under treatment bear fruit, and the improvement wrought through the stay in the sanatorium merge into health restored and the joy of living.

THE EARLY CLINICAL DIAGNOSIS OF PULMONARY TUBERCULOSIS AND THE BEGINNING OF THE ANTI-TUBERCULOSIS CRUSADE IN FRANCE.*

By AUGUSTE A. HOUSQUAINS, M. D., of Paris.

Tuberculosis is one of the great scourges which decimate mankind. To its contagiousity is largely due its dissemination, not only in crowded urban districts but also in the country. A large number of individuals in the active and productive period of life are struck down by this disease,—a cruel attack directed against nations in that the best forces are decreased. In all civilized countries, it is one of the principal factors in mortality. France pays a particularly heavy tribute, as tuberculosis in all its phases contributes to her mortality about ten out of every hundred deaths. This social disease, as it has been rightly called, has attracted the attention not only of doctors, but of legislators, no matter what their politics, in all countries, and that this attention is serious is evidenced in their efforts to combat it in a rational and methodic manner. Although it is a fact that in the majority of European countries the birth-rate is decreasing and this decrease is linked to causes so numerous and complex that there is no hope of halting it for a brief space of time, there is nevertheless the compensation that a decided interest is being taken to lower the death-rate. And since tuberculosis is one of the active causes of a large mortality, it is important that we should fight it and at least limit its ravages. This is the program that is being followed by all governments at the present time, and which they hope to realize, each engaging in the fight according to its aims and social possibilities.

Modern science has established two axioms which are no longer the subject of controversy: First, tuberculosis is an incurable disease, and secondly, tuberculosis is a preventable disease. But to cure the patient and to protect the healthy person are the two objects of the anti-tuberculosis crusade. To accomplish either of these ends there must be a sufficiently early diagnosis of the disease. Tuberculosis is, in fact, curable, but the cure would have better chances of occurring and be easier of accomplishment if the patient were treated in the earliest stage. The fewer the lesions the less their extent and depth, and also the less will the organism be enfeebled and impregnated with tuberculous toxins, and the greater will be the hope that the therapeutic measures used will be crowned with success. What is most important is to treat the patient early; and to do this a recognition of the disease is absolutely

*Translated by Dr. Philip Skrainka.

necessary. To prevent its dissemination—to surround the healthy with a sanitary wall that will act as an obstacle to infection—it is indispensable to give the greatest publicity to the possible sources of contagion, and isolate, as soon as possible, all cases of bacillosis. The sooner we realize the presence of tuberculosis the greater will be the efficacy of the measures undertaken. Hence it can easily be gathered that it is of vast importance to make an exact diagnosis and this at the earliest possible time. In France to-day the anti-tuberculosis crusade has for its main object the ferreting out of the disease in its incipency. Diagnosis then should be the initial act in the crusade against the Koch bacillus, for it cannot be gainsaid that the earlier it is made the greater will be the success of all prophylactic and curative measures.

For a number of years efforts have been put forth to discover the symptoms which would indicate the eclosion of tuberculosis and how to diagnose the disease when still in an obscure state. Professor Grancher was the first to show how this could be done. Towards the close of the nineteenth century he demonstrated that pulmonary induration, indicating the first stage of tuberculosis, was preceded by a phase of the disease that was quiescent and went often unperceived. This phase he called the period of germination, and he showed that the abnormal respiration betrayed the condition. According to Grancher, the period of germination was the real beginning of the disease, the first development of tubercles that were too scattered throughout the pulmonary parenchyma to cause the pathological auscultatory sounds. The stethoscopic signs which characterize this stage of the disease have been called by this authority 'signs of incipency.'

But to-day Grancher's conception of the earliest possible phase of the disease is no longer admitted, due beyond a doubt to the many researches to which tuberculosis has been subjected in recent years, and which have led to a complete change in our ideas, with the result that the conception of incipient tuberculosis has been completely modified. In this paper all that is necessary is to recall briefly two dicta of the new theories known to all physicians: Diagnosis of incipient tuberculosis; and the restriction of the patient, after giving due thought to all possible objections to this procedure.

It is almost universally admitted to-day, as we know from the investigations of Burnet, Kuess, Nægelin, Hamburger and others, that tuberculosis is a disease of childhood. In exceptional cases there are evidences under one year, and thereafter the frequency increases progressively according as the septic processes multiply; when the subject advances in years, so thoroughly is the disease developed that, following the statistics furnished by the von Pirquet test, it can be said in all truth that almost the entire population of our great cities is tuberculous (from 92 to 95 per cent.). Among

adults tuberculosis should be considered an awakening of a disease that has been dormant since childhood and a reinfection of an organism sensitive on account of the first attack. Almost all human beings are, be it said here, in the clutch of tuberculosis or rather in that state of allergy which constitutes an equilibrium more or less stable between immunity and anaphylaxis.

Influenced by the recent ideas of tuberculosis, criticism has been visited on the 'signs of incipency' as advanced by Grancher. It has been said that these signs, which can persist throughout many years without revealing any sort of advance in the disease, are not positive evidences of a beginning lesion, but are indicative of an old lesion, of a latent tuberculosis in a state of quiescence, or of a tuberculosis cured of an abortive attack (Bard). Hence, these signs do not indicate in a positive manner the incipency of the disease. In fact, the beginning is more remote and is really synchronous with the appearance of a pulmonary *chancre tuberculeux* which remains unperceived, but which leaves as traces consecutive respiratory modifications. Therefore, it can be said without fear of criticism that Grancher's 'signs' have not the value they had when first brought to the notice of the medical profession. They are not synchronous with the pulmonary eclosion of the disease, and if they reveal a previous attack they do not give us positive proof that the phase of tuberculosis through which the patient has passed is completely cured, or when the vitality is below par there may not be another outbreak later on.

On account of the fact that in many cases it is a very difficult matter to make a positive and early diagnosis, the thought occurred that perhaps other biological methods would facilitate the solution of this problem; hence the laboratory with its careful and conscientious work was called into play. Very numerous, indeed, are the procedures which in turn have been attempted and extolled. The cutaneous reaction (von Pirquet), the percutaneous reaction (Moro, Lignières, Lantier), the intradermal reaction (Mantoux), the ophthalmo-reaction (Calmette, Berton, Petit and Paimblan, Wolff-Eisner), the sero-agglutination (Arloing and Courmont), precipitin test (Bonome, Vincent and Combes, Dousset), the opsonic index (Wright), anaphylaxis (Marmorek, Vamamonchi), cobra poison reaction (Calmette, Massol, Breton), and finally the fixation test (Widal and Le Sourd, Camus and Pagnier, Wassermann, Marmorek). The methods which have just been cited have shown by their results that they should enlist our fullest confidence. Some of the tests are so sensitive that they give positive results in the non-tuberculous and in other diseases, especially in many febrile affections. The greater number of the tests are so complicated and delicate that only a skilful person, with a special training, can make them, which is not always the case in practice. Finally, all of them offer the same objection: they may show that

the organism has been tuberculous, but they do not tell us whether the lesion is completely cured or merely dormant. Hence to a certain extent they merit the same criticism as do physical and stethoscopic signs.

Radioscopy and radiography have been employed, but these enlighten us only as to the physical state of the organs and as to their greater or lesser permeability to the rays; they show plainly the anatomical alterations, but they yield no information as to the nature of these alterations or their actual activity. To ascertain the real significance of the pictures taken, they should be interpreted by the aid of a clinical examination. In case the Koch bacillus is found in the sputum, a pathognomonic sign is achieved; but what should not be overlooked is the fact that, in spite of the great progress made in the matter of technique (homogenisation, inoscopy, antiformin-ligroïne), the examination for bacilli is often negative when they are not numerous, which is moreover possible in open tuberculosis. In short, in the incipency of the disease, this examination will often prove of no avail.

The work in the laboratories, excellent though it has been, has not been able to supplant the clinical methods of examination; and despite what claims may be put forth on behalf of the former, the latter are holding their own. The good that has come out of the laboratory should combine with what the clinical examinations have taught us, and in this way a combination could be effected that would be a decided help to the physician.

In France the clinical method has precedence. The French school of medicine, without discrediting or neglecting the results obtained in the laboratory, and fully aware that occasionally such corroboration of clinical data is necessary, remains true to its hundred-year-old tradition, in that it sets the greatest store by clinical investigation. Hence, in my discussion of tuberculosis from the French point of view, it would be well for the reader to bear in mind that the clinical aspect of the disease is the idea which influences my thoughts.

No matter what period may be thought the real beginning of tuberculosis, no matter whether the recent theories, of which mention has already been made, are absolutely correct, there is nevertheless a period in tuberculosis, latent though the disease be up to that time, when it becomes manifest and diagnosis is possible. It is this period which marks for the practitioner the beginning of the disease. Putting aside all doctrinal prejudices, we understand then by the incipency of tuberculosis the clinical beginning of the disease.

In passing, it would be well to state that if tuberculosis is a disease of childhood, the physician should strain a point to discover it in the child, and the anti-tuberculosis crusade should begin in the school.

In a disease, such as tuberculosis, the examination, unless thorough, does not yield enough data upon which to base a diagnosis. Certain signs have been known for some time: frequently, the flattening of the thorax with its anteroposterior diameter lessened, the retraction of the subclavicular space, a diminution in the expansion of the apex ascertainable on palpation, and a scapulo-thoracic amyotrophy more or less developed. The exaggerated projection of the shoulder-blades is common knowledge. Other peculiarities in regard to the shoulder-blades are the lack of symmetry, and of synchronism as to their movements; the shoulder-blade corresponding to the diseased side has a sweep of less amplitude (Bacelli), its movement begins with a slight retardation on the opposite side (Ringer), and its spine is deviated outwardly by atrophy of the trapezius.

Formerly these classical signs were thought to be indicative of a predisposition and connected with the pretuberculous stage. To-day authorities associate most of them with the first eclosion that has occurred unperceived during the disease. It would seem that they are less characteristic of an exacerbation of the disease than proof of a former attack. This opinion may be thought too sweeping, but it is a fact that the signs which have been mentioned, even though they draw attention and guide the examination in a certain direction, are not by themselves sufficient to diagnose the actual beginning of a tuberculous exacerbation.

Of a far different value are the signs derived from auscultation. These are of the greatest importance in the early diagnosis of the disease. Grancher and his pupils made a minute study of them, and their account of their observations has to-day been adopted by all physicians. Grancher insisted on a certain way in which auscultation should be practised when the object of the examiner is to ferret out tuberculosis, his advice being to listen at first only to the inspiration. In fact, the first modifications characteristic of tuberculosis are evidenced during inspiration. In the incipency of the disease the tubercles are too scattered to cause extensive alterations in the pulmonary parenchyma. The auscultatory sounds are also generally totally absent in this period, and only modifications in respiration are observable,—only abnormal respiration which should engage the serious thought of the physician and be studied most carefully. These respiratory anomalies Grancher divided into strong, weak, continuous, and tonal. But these different varieties may occur in twos and threes.

The sign which, according to unanimity of opinion, has the greatest value and is the earliest, is harsh inspiration. Inspiration, which in the normal state of the lungs, is smooth and almost noiseless becomes in tuberculosis uneven; the pitch is lowered, thus converting the normal sound into one that is harsh and flat. In spite of all criticism, this symptom appears to be one of the most trustworthy

and dependable. However, to be of value as an indication of incipient tuberculosis, it must be fixed and localized. A harsh inspiration that has not this double characteristic of permanence and undeviating localization has no value as a proof of bacillosis, since harsh respiration is observed in all bronchial and transitory congestions of simple origin (colds, whooping-cough, measles, etc.). On the other hand, if it is possible to assert that the inspiration is harsh, flat and persistent, and is localized in one apex only, the diagnosis of a pulmonary lesion can be made with certainty.

Another sign of incipient tuberculosis that often occurs is weak inspiration. This is more frequent than harsh inspiration, and many authors consider it a sign which occurs later in the disease. It is accompanied by a decrease in the pulmonary expansion and is located most often on the right side. Weak inspiration, too, has come in for some severe criticism. It has been noted in other diseases besides tuberculosis. This sign to be of value to the diagnostician must also be permanent and localized. Méry attributes it to a tracheo-bronchial adenopathy rather than to a lesion of the lung; and, in fact, a weakened respiration occurring in the entire upper part of the lung is characteristic of a mediastinal adenopathy. The fact that it occurs most frequently on the right side is due entirely to the anatomical arrangement of the tracheo-bronchial ganglions which, according to Baréty, are larger, even normally, on the right than on the left side. In children, weak respiration stands in close relation with adenopathy; in adults, on the contrary, a pulmonary or pleural lesion would seem to be the cause. Be this as it may, weak respiration has undoubtedly a real value as a sign in the diagnosis of incipient tuberculosis, for Bezançon, at the Boucicaut Hospital, has been able to trace tuberculosis in two-thirds of his cases by means of weak inspiration. The numerous positive results from tuberculin reactions have verified this method of arriving at a diagnosis of the disease.

The two preceding signs often occur in the same case, and occasionally the inspiration is weak, harsh and flat at the same time.

Jerky inspiration, to which Herard and Cornil and especially Peter attached great importance, is often associated either with weak or harsh respiration. It may be present in a pulmonary or pleural lesion. But what should be remembered is that it does not occur so early as harsh respiration.

Finally, there is another sign which Grancher recorded as important and Professor Letulle thinks is of great moment, and which has a significance of the first order—namely, dissimilar respiration. The vesicular murmur in both lungs should be carefully compared, for, as has been advanced by an authority, the vesicular murmur has, in the physiological state, the same intensity and timbre in both apices. Therefore, a lack of respiratory symmetry

is pathological, and, if one of the apices yields an inspiration weaker or harsher than the other, tuberculosis should be suspected.

During the first stage of the disease the symptoms are limited to respiratory anomalies, without superadded bruits, modifications in sonority or in the vibrations. This phase may last many years, and the disease must be considered stationary, so slow is its progress.

In the second stage, in addition to the modifications in inspiration, there is an increase in the thoracic vibrations.

The third stage, besides the preceding signs, is characterized by decreased dullness on percussion occurring with prolongation of the expiration, which becomes harsher; while the number of inspirations are increased, become weaker, and have a tendency to disappear. At times, even in this period, dry crackling sounds or crepitant râles may be heard, but these pathological auscultatory sounds are generally variable and transitory.

Such is the clinical picture of incipient pulmonary tuberculosis during the first period which is known as the period of germination. If the lesions spread, there follows the usual evolution of chronic pulmonary tuberculosis, and the period of germination is followed by the first, second and third stages of the disease. Since the first classic stage, as has already been mentioned, is not the first manifestation of incipient tuberculosis, further mention of it here is unnecessary. This stage really belongs to that period of tuberculosis when the disease is present beyond all doubt.

To sum up, the following are the signs of incipient tuberculosis: At first only inspiratory changes, fixed and localized in one apex; then, according to diagnostic value and time, harshness and lowered tone of inspiration, weak inspiration, jerky inspiration, with all the combinations of these three modalities, and dissimilar inspiration; and in the second place, increase in the vocal vibrations superadded to the preceding stethoscopic signs, modification of the tonality on percussion, prolonged expiration without interference with the respiratory anomalies, and exaggeration of the vibrations.

These signs, which are to-day recognized by the majority of French physicians, have been, as has already been mentioned in this paper, the subject of more or less severe criticism. Marfan, Vanot, and Bard have doubted the value of harsh respiration as a sign in the incipency of the disease. Bard asserts that this sign is characteristic of an abortive attack of tuberculosis, a pulmonary sclerosis, which instead of being the incipency is the result of a special and quiescent form of the disease. Weak inspiration has also invited analogous objections; and jerky inspiration is according to Potain a kind of extracardiac bruit due to the resounding of the heart-beats in the lung. In fact, even if in some relatively rare instances the harsh inspiration can occur in other diseases

besides tuberculosis, if the same can be said in regard to weak inspiration and to jerky inspiration, of which the significance is not always invariable, it must be admitted, however, as has been shown in the studies of Grancher, Turban, Méry, Armand Delilles, Bezançon, etc., that these signs, and particularly the harsh and lowered inspiration, are in the great majority of the cases an occurrence of tuberculosis and, clinically, of incipient tuberculosis, and that legitimately they ought to be considered as significant signs of this disease. However, Grancher himself, whose name recurs in this paper again and again because it dominates the question of incipient tuberculosis, recognized that the preceding signs even when localized in one apex only and permanent, were not sufficient evidence by themselves, and that it was necessary to add to them the weight of the general symptoms. This is in fact the keystone of the arch which goes to the making of a positive diagnosis of bacillosis in the first period. Therefore, if for certain authorities the so-called signs of incipency are only evidence of a cicatricial condition caused by a previous lesion momentarily inactive or dormant, the weight of the general symptoms, linked with that of the already mentioned stethoscopic signs, will be the means of demonstrating to the physician that the disease is undergoing a new evolutionary stage, an awakening of a dormant infection, and that the active outbreak, attesting as it does the development of a latent disease, is really a destruction of the old allergic equilibrium. Hence, to repeat what has already been mentioned in this paper, we have here, in a clinical sense, the beginning of the disease.

Among the general symptoms, which should make us suspect incipient or at least menacing tuberculosis, are those which may be grouped under predisposition. In the older conceptions of the disease, these formed an important part of the pretuberculous picture. To-day they are interpreted in a different manner and are regarded as the result of an unperceived first attack, as an indication of an old infection which has impregnated the organism and modified its normal development. Following this idea, special facies have been noted, the vasomotor disturbances determining partial erythrim, the exaggerated development of the hair, the pupillary inequality, the thoracic deformities already mentioned (subclavicular depression, sinking of the acromial extremity of the clavicle, projection and deviation of the shoulder-blades), the sub-normal thoracic circumference, the small volume of the heart in contrast with the great volume of the lung, the gingival line of Thomson (a red line by contrast with the pallor of the surrounding tissue), the micropolyadenitis, modifications in the pulse, sometimes accelerated or very bounding and rapid (Corrigan's pulse), intermittent albuminuria in the morning, etc. All these symptoms are far from being negligible, but they are not so important as

they appear at first sight. Although they show that at some time the organism was infected, they do not demonstrate with certainty that the organism is undergoing an evolutionary attack.

A similar attitude should obtain as regards the scrofulous cicatrices of patients and all the other insignia which have engaged attention: tuberculous heredity, alcoholism, the giving up of life in the country for an existence in town, an old pleurisy or some other pulmonary affection, or particularly whooping-cough and measles. All these disturbances should not go unnoticed, for they might be of help in the diagnosis; but they have no great intrinsic value.

There are others, on the other hand, which are especially significant. When tuberculosis, which has been latent, begins to accelerate and manifest itself, the general condition is undermined. There is a decrease in strength, a depression which may advance until there is a typical condition of neurasthenia, and at the same time a decided loss of flesh. This is a verification of the disease. All loss of weight, not explainable in any other way, should make us suspect the Koch bacillus.

It is well to understand that the loss of flesh must be progressive and due to no other possible cause. All persons suspected of having the disease ought to be weighed regularly. Another definite indication is furnished by the study of the temperature. In the incipency of the disease there is fever only after exertion, an elevation of temperature more or less accentuated following a walk or any physical effort, and ceasing after twenty minutes or a half hour of rest. More often there is present a subfebrile condition with morning remissions, the temperature increasing at night. This elevation is generally slight, and can be reduced several tenths of a degree; but what is noteworthy is the regularity of the temperature curve which shows daily an evening rise. This curve is of the greatest importance in the diagnosis. At times the fever becomes continuous. There are cases on record in which only a local hyperthermia more or less pronounced has been noted. Finally, to complete the list of symptoms, mention should be made of the subjective fever: the patient complains of malaise, weakness, of a sensation of warmth and even of cold, in a word, of all the habitual subjective symptoms of fever despite the fact that the thermometer shows no decided rise.

Besides the symptoms of the first rank there are other indications of an undermining of the organism: digestive disturbances, suppression of the menses, etc. The localization of pain betrays itself at times by means of thoracic pains below the clavicle or between the shoulder-blades (stitch in Peter's apices), or by an access of asthma. The relation between asthma and tuberculosis is well known, and asthmatic tuberculosis and tuberculous asthma are common knowledge. If to all the preceding symptoms are added the disturbances of phonation (muffled or veiled voice) and the

cough, the diagnosis is decidedly easy of accomplishment; but these symptoms are rare in the incipency and belong to a stage of the disease which occurs later. The same obtains in regard to expectoration. In all cases of closed tuberculosis expectoration is lacking, and this form of the disease is peculiar almost to all the cases in childhood, and to the numerous cases of incipient bacillosis in the adult. On account of expectoration being absent in this phase of the disease, the finding of the Koch bacillus, which would be proof positive, is not possible.

To sum up, the clinical diagnosis of incipient tuberculosis is a very difficult matter, but it is almost always possible. It is necessary to remember that there is no pathognomonic sign, but that it is the *grouping of the symptoms* which decidedly helps in arriving at a correct conclusion. An isolated symptom is insufficient and can yield only a probability, but many simultaneous symptoms may make the diagnosis certain. To determine whether the patient has incipient tuberculosis, it is necessary to compare the stethoscopic signs and the general symptoms. The latter are indicative of a re-awakening of tuberculosis, that it is developing and should be treated at once; whereas the former mark the pulmonary localization and demonstrate a first attack of the organism. To reiterate, the diagnosis of incipient tuberculosis is dependent on stethoscopic signs and general symptoms. This is an opinion that should always be remembered and be ever present in the mind of the physician, so that he may not regard a patient tuberculous, and therefore to be isolated, who does not show any actual development, or, on the other hand, neglect as 'cured' a patient in whom the disease is progressing. The rough inspiration with a deep tonality, fixed and localized, a dissimilarity in the respiration, progressive loss of weight and the rise in temperature constitute the most reliable indications and the ones which should always be systematically looked for.

Here it would be well to call the reader's attention to the fact established by Méry, that especially in children tuberculosis attacks the mediastinal ganglions and that the disease itself is generally gangliopulmonary. Certain authorities even assert that ganglionic tuberculosis can constitute the initial attack. We must therefore not confine ourselves to searching only for tuberculosis localized in the lung, but take into consideration the condition of the ganglions, and discover by methodical auscultation whether or not there is a tracheo-bronchial adenopathy present. This can be recognized by the usual stethoscopic signs. As to the functional signs which are so striking in the adult, we know that, as a rule, they are absent in children, but when present are limited to the collateral circulation at the upper part of the thorax.

In the foregoing, I have summarily set forth the practical methods by which tuberculosis can be diagnosed at the earliest pos-

sible time and which are at the command of all physicians. This tracking down of the disease is, as we have said, the basis of the anti-tuberculosis crusade. It is now in order to explain the measures which should enlist our attention if we desire to complete the program in the interests of the prevention of tuberculosis. Similar to all programs of defense, as regards infectious diseases, there should be two groups of methods: those which combat the invasion of the specific bacillus, and those which have for their object the rendering of the organism immune to the growth of the bacillus. The latter methods include all personal and social hygiene. In a disease as widely disseminated, transmissible and fatal as is tuberculosis, the activities of the hygienic movement should have no limits as to personal measures, the cure of the disease, and the rules of prophylaxis affecting the immediate entourage of patients. Above all, the hygienic propaganda against this disease should be social and made up of general methods. To make these effective the activity of the attending physician does not suffice; but what would render them of the highest value, is the intervention of the state. This has been understood in all civilized countries.

If, in the first place, to quote Professor Landouzy, "Alcohol is the cradle of tuberculosis," and if as Professor Hayem says, "Phthisis has its birth in the cup," then the anti-alcohol crusade must be the corollary of the fight against tuberculosis. In regard to alcoholism, the measures which are in vogue in France to-day are altogether lacking in efficiency. The anti-alcohol crusade is a private matter and not a public one; it is held in check by the hygienic rules advanced by the anti-alcohol societies. The unanimous opinion of doctors and competent authorities is still futile, as it has been powerless to obtain the municipal rights to circumscribe the sale of drinks, the curtailing of privileges enjoyed by distillers, or the interdiction of the sale of absinthe. The Prefects in the various French Departments have recently issued circulars interdicting the sale of alcoholic drinks within a radius of 200 metres of certain buildings, schools, barracks, etc. This is a step in advance, but a step that is insufficient and of little efficacy. There is much more to be done, and it would seem that the most urgent measure would be to limit the number of licenses.

Among the general preventive measures, school and factory hygiene should be mentioned.

The anti-tuberculosis crusade, as we have said, should begin in the school. This is appreciated in France and work in this direction has already been done. The question as to hygienic locations has been taken into consideration when constructing schools. Medical school inspection has been organized, and the medical inspectors compelled to give to each child a health certificate, and to make announcement of the first signs of tuberculosis. If the indications

revealed in this examination show a suspicious or genuine case, the child is sent to an open-air school or to a sanatorium. These school colonies during vacation, which permit poor and sickly children to spend a few weeks every year in the pure country air, must be reckoned among the prophylactic measures against tuberculosis. Unfortunately there is still much to be done in this direction, since medical inspection is carried out thoroughly only in a few of the great cities, and the open-air schools are very limited in number.

Industrial conditions, too, should be improved by a thorough hygienic supervision of factories in regard to ventilation, the matter of well-lighted rooms, and, above all, the sort of work adapted to women and children.

Finally, in this part of the paper, special mention should be made of what is a momentous matter—the proper housing of people. In Paris and in most large French cities, the number of insanitary lodgings is legion. All physicians are aware of these cramped and poorly lighted rooms where entire families exist in an atmosphere that is close and mephitic. To be truthful, there is a Commission in Paris that looks after insanitary lodgings, inspects them with care and reports thereon, but these reports are not followed up with any effective measures. Also, for some years, there has been in Paris a Registry where there is kept a list of all those lodgings in which there have been the greatest number of cases of tuberculosis. But here, too, the inspection has not been followed up with drastic measures. Once a house is contaminated it is always so, but the laws in France to-day will not permit the Registry to inform the occupants of the risk they are running by remaining, for then the owner has the right to bring action against the city of Paris. The idea of a Registry in the interests of the proper sanitation of houses is excellent, but to make its work effective a certain number of legislative measures would be required. Besides the general prophylactic methods which are being instituted to lessen the chances of the healthy person to contract tuberculosis, there are those which have for their object the cure of the disease and its harmlessness for citizens as a whole. These are the methods which go to make up the real program of the anti-tuberculosis crusade.

To begin with, the sanatorium is the best means at our disposal in treating tuberculosis systematically and preventing as far as possible its being a source of contagion to others. But in France sanatoria are not on a par with those in other countries. This is due to the fact that they have not met with much favor or inspired the confidence of the people, adverse opinions which must be attributed to the French national trait of opposition to a treatment that is practically isolation. A Frenchman revolts against discipline and unswerving rules; hence he cannot appreciate the advantages of an institution that must be the very opposite of lax, or

fail in its endeavors. French sanatoria, although not completely deserted, are of secondary importance in the public mind.

In the anti-tuberculosis crusade in France to-day no factor is of greater importance than the 'dispensary.' In the course of the last few years it has undergone a complete change. In the beginning it was a preventorium, its rôle being to educate the sick in regard to the washing of linen, good food, heating, bedding, the disinfection of the home; and money was given where needed. But one was not taken care of (in a medical sense) at the dispensary; no medical advice was given, and no medicines. However, this limited function of the dispensary was soon modified and out of the preventorium arose the anti-tuberculosis dispensary where treatment was given free. The anti-tuberculosis dispensaries, public and private, began to increase in number. One of them, the Siegfried-Robin, occupies a position that is intermediary between a preventorium and a dispensary, and is a bureau of information for the tuberculous patient, to whom, besides the ordinary advice, it gives exact information where his case can best be treated—dispensary, sanatorium, or hospital. But these ideas are incomplete and leave much to be desired. It is the opinion of some that, if there were a closer relationship among the various organizations, their efficacy in the fight against tuberculosis would be heightened, for only in unity can the most commendable ends be achieved. Following this line of reasoning the dispensary should be the central station to which all others are tributary. At the *Conseil de Surveillance de l'Assistance Publique*, M. Léon Bourgeois, president of the permanent Commission for Prevention of Tuberculosis, dwelt on this point in the following words: "Our dispensary should in reality be the great consultation hospital for the tuberculous, a combination of urban and suburban hospital." The dispensary would thus be the principal organization which unites hospitals, sanatoria and all charitable societies at present working on their own lines and having no connection with each other. With this thought in mind M. Léon Bourgeois introduced in the Senate on July 25th, 1913, a bill the first clause of which was to the effect that in the Communes dispensaries should be started "which would not only serve the purpose of educating the people as to hygiene, but also be the means of uniting the charitable organizations."

From the foregoing can be seen how France at the present time is interpreting the fight against tuberculosis. Without a doubt, all the good points which have been mentioned have not as yet been realized, and considerable time and money will be required before the campaign will be general and extend throughout the whole country. But a start has been made, and the *Assistance publique de Paris* is doing all it can to carry on the good work. The dispensary which has already been opened and of which others will

follow is the Léon Bourgeois Dispensary at the Laënnec Hospital; and that its work is commendable is attested by the interesting and documentary study which M. André Mesureur, secretary of the *Assistance* has recently published. A few words will now follow so that the reader may know what has been accomplished. Three physicians are employed in the Dispensary, and daily they take turns in the examination of patients. Next to the consultation rooms are a laboratory for bacteriological work and also one for radioscopy. The patient, after the consultation, is sent home, where he is visited by two members of the Dispensary staff; one to ascertain his financial condition, the other, a nurse, to advise him and the family, and inform the latter what prophylactic measures should be instituted (ventilation, alimentation, cleanliness, the sort of spittoon to be used, etc.). The information gathered from the visits made by the members of the staff is of great value. In case the children of tuberculous parents are free from the disease, they are sent to the Grancher Foundation; if they already have the disease, they are sent in the beginning to the Handaye Sanatorium, and later to a Children's Hospital in which only tuberculous patients are treated. Once a week the linen is removed from the patients and washed in the wash-house at Ivry; in case the patient remains at the Dispensary, his clothes are disinfected during his stay; once a week he takes a bath. Finally, the measures which have just been described are supplemented, as soon as possible, by the disinfection of the home. The Léon Bourgeois Dispensary does not limit its work merely to the examination of patients; it is conducted, rather, like a sanatorium. As M. André Mesureur remarks, this innovation is very important and is of the greatest value to the tuberculous from a medical standpoint.

The patients pass the day, from 8 a. m. to 6 p. m., in the rooms set apart for them. They wear the clothes supplied by the Dispensary, are fed at 11 a. m. and 5 p. m., receive a portion of raw meat at 3 p. m., and are given the medical attention the case requires. Naturally, this treatment in a large city only during the day is not the most effective method of handling the disease from a therapeutic standpoint, but it has the advantage of giving the patient healthy and sufficient nourishment, and for a limited time a healthy and well-ventilated shelter removed from the temptations of drink. The Dispensary, on account of being the repository of all sorts of information which come to it from the patients themselves, engages in personal service by helping as best it can, and when the occasion arises paying rent.

Finally, the Dispensary selects the institution that will be of the greatest benefit to the patient and in a locality most convenient, be the place a hospital in city, in the suburbs, or a sanatorium. The idea of an urban hospital for the tuberculous is illustrated in the

various services in a number of Paris hospitals (Laënnec, Boucicaut, Cochin, La Pitié, Saint-Antoine) ; and in lieu of the fact that as yet there is no hospital for the tuberculous only, these services are highly commendable. The suburban hospital's best representative is the Brévannes Hospice, where only chronic cases are taken, "in case they can be about, can be benefited by a sojourn of two or three months in the country, and can travel without being carried on a stretcher." This Hospice serves as a convalescent home for the tuberculous after being in an urban hospital during the acute stage. The Villemin Sanatorium (for men) at Agincourt, the private Larne Sanatorium (for women) which is on a broader scale than the Dispensary, complete the list.

The city of Paris will soon erect a vast institution for the tuberculous at Mare-Plate on a plateau 180 metres in altitude. This hospital will have beds for patients in all stages of the disease. It is to be hoped that the project, to add a 'home' for those tuberculous who are in fairly good health, will be carried out.

From what has been mentioned in this paper, a fair idea may be had of the newer conception of how to handle tuberculosis and in what respect it presents original ideas. The functions of the dispensary are on behalf of prophylaxis, treatment and assistance. Besides this it separates the patients into different classes with the view of sending them to the institution in which the case will receive the best treatment. This is what might be called a complete centralization in the management of the tuberculosis problem. From the dispensary, as from a commander, come the orders, it unites and coordinates the various institutions; in short, it rules them, and the word of the dispensary doctor is the word which carries weight. Such is the new formula which to-day is being followed by the *Assistance publique française*.

Statistics indicate that the Léon Bourgeois Dispensary is actively engaged in this work. In fact, the number of patients has grown to such an extent that it has been found necessary to limit the clientele to certain precincts in order to enable it to accomplish the task it has undertaken. There is no doubt that the *Assistance publique* will have subsidiary dispensaries in Paris as soon as funds are available. As has already been stated, a law should be passed to have dispensaries built throughout France.

To complete the vast program involved in the anti-tuberculosis crusade, the Academy of Medicine recently expressed the wish that notification of all cases of tuberculosis should be made obligatory. Notification could be followed up with disinfection of the lodging, and with assistance to the patient. But obligatory notification is not regarded with favor by the French medical profession, who see in it only an attack on professional secrecy, and are fearful that a patient thus singled out will be considered by the community in the same light as one affected with plague.

It should be pointed out that notification of a case of tuberculosis would not be effective unless followed by disinfection of the lodging and assistance to the patient. No doubt a periodical disinfection would be of a more or less doubtful advantage, but what is necessary is a complete and obligatory disinfection after a death, and, more so, the disinfection of every house after a tuberculous patient has moved, and before new tenants move in.

The anti-tuberculosis crusade is so big a subject that in a paper the length of this one, it is impossible to go into all the details, hence I have merely touched upon the principal factors. This crusade may be summed up, on the one hand, as containing all the measures of general hygiene, both personal and social, and, on the other, as a combination of measures already known and which will be strengthened by those to be learned in the future in the special fight against the disease. To combat alcoholism, to improve the hygiene of schools and factories, to war against insanitary lodgings by building, as has already been done in Paris, workingmen's homes at cheap rental, to disinfect the lodgings in which the tuberculous have lived, to encourage the use of the spitting-cup, to help in a financial way the indigent who have the disease, to increase and group the number of institutions specially dedicated to treatment and prophylaxis by uniting the efforts of all organizations, whether public or private, which are as yet too far apart to be effective, to increase the activities of the propaganda of to-day which have been described in this paper but are still quite undeveloped,—such would be a wellnigh complete program for the crusade against tuberculosis. There is yet much to be done until this fortunate goal is reached, and some time will be required,—perhaps years,—before its accomplishment. But one point is already understood and appreciated—namely, despite our gropings and all sorts of attempts—some good, others futile—there has come to us the knowledge that, only when the standpoint in the crusade is that of the majority and is the outcome of a methodical plan, can it hope to reach the heights of success.

In closing, I would reiterate that, in a strictly medical sense, it is the early diagnosis of tuberculosis that is the prime factor in the crusade.

OPEN-AIR SCHOOLS IN THEIR RELATION TO PULMONARY TUBERCULOSIS.

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monary Tuberculosis of the City of New York, etc. etc.

During the past few years, the teaching of children out of doors has grown from a single experiment in 1904 to the institution, in the United States alone, of over two hundred established and successful open-air schools. It is probable that the total number in operation at the present time throughout the world, is in the neighborhood of one thousand, and as is shown by an interesting pamphlet issued by the Russell Sage Foundation (*Bulletin E-134*), the rate of increase seems to be a doubling of the preceding year in each successive year.

In 1908, three cities in the United States had open-air schools or classes; in 1909, seven; 1910, fifteen; 1911, thirty-two; in 1912, sixty; and in preparing data for the following article, I have personally sent out a questionnaire to about two hundred different schools in some eighty-six cities. In this list I do not claim to have included all the names of those now operating in the country.

The early open-air schools were designed for anemic and weakly children and those predisposed to tuberculosis. The first, started in Charlottenburg, Germany, was of this type, and those opened in England, in the years immediately following, were also for children suffering from tuberculosis, scrofula, anemia and similar diseases in the earlier stages. An excellent history of the movement is given in Ayres' book,¹ with a complete bibliography up to the date of publication, and there is also an interesting article on "Open-Air Schools" by Dr. Ayres, giving similar general historical notes, which he read before the 1912 Annual Meeting of the National Association for the Study and Prevention of Tuberculosis (*Transactions*, pp. 77-83).

More recently educators have pertinently asked themselves why, if open-air schools are good for the ailing, they would not be as good, or better, for the well; and, as will be seen later on, a number of the replies I have received are from the officers of schools for children in perfect health.

The aim of my present study is to treat the relation of open-air schools to pulmonary tuberculosis from its preventive and curative

point of view; but this cannot be done fully without investigating the influence of open-air schools on children who are apparently healthy, but of whom a large proportion may become tuberculous in greater or less degree in later life.

Although experiment was first made ten years ago, the system has only been extended within the last five years, and so much of the work has been of an experimental nature, that it is too early to speak authoritatively from experience on a number of phases of the subject.

While it is not well to rely on theories in the incipiency of a movement, a theoretical study must direct the experiment. If careful records are made of a sufficiently large number of children educated in open-air schools, and comparisons are made between children affected by disease and those in normal health, it will be possible, later on, to draw definite conclusions from authentic record. In the latter part of this paper, I shall be able to give a small amount of experimental data; but, in the present stage of the movement, this must, of necessity, be so slight that I shall first review the situation from a more theoretical point of view.

THEORETICAL DISCUSSION.

In the eradication of tuberculosis, effort must be maintained on two lines: One of these directed toward the prevention of infection; the other to increase of resistance to the invasion of the micro-organism. It will be less confusing to consider these two points separately, and to do this, in the first place, I shall consider children who are already infected or predisposed, and secondly, those who are apparently in normal health.

Tuberculous and Predisposed Children. Elimination of the Germ.—Rosenau,² in his discussion of immunity in the human being, says "exposure to a vitiated atmosphere, if of long duration, is one of the potent causes of breaking down resistance. Here, again, however, immunity is lowered in a specific and not in a general sense. Thus, vitiated air renders the individual more susceptible to tuberculosis, pneumonia, common colds, and other acute respiratory affections."

The average school requirement in the matter of ventilation, is that thirty cubic feet of fresh air, warmed to such a temperature that the prevalent temperature of the room will be about 68° F., shall be supplied to each pupil per minute. Ordinarily, this air is taken from the outside and passed over heated coils or furnace drums, or tubes. This air is rarely heated sufficiently to destroy germs that it may contain, and when that is partially accomplished, such parts of the air as are so overheated have a disagreeable 'burned' odor. Therefore, from the infectious point of view, the air is not improved. It deteriorates markedly, in that it is in-

creased in volume, while no additional moisture is supplied, with a result that the degree of saturation is very greatly reduced. The unusually dry air tends to remove the moisture too rapidly from the mucous linings of the respiratory passages, resulting in irritations of the membranes, which makes them more susceptible to germ attack. On the other hand, in many institutional schools, through carelessness or in a culpable effort for economy, the ventilation is often not maintained. The air is warmed by secondary radiators and by the children in the room; movement of the air ceases, moisture is increased by evaporation, temperature rises and all the effects of vitiated atmosphere proclaim themselves.

In either case, if disease germs are given off from infected children, either indirectly from handkerchiefs, clothes, contact with the hands, etc., or from droplets, etc., even though, in the case of tuberculous children, the sputum is properly cared for, the dust that is necessarily stirred up, from time to time, will, in greater or less degree, propagate the infection. In view of the experiments and investigations of Heymann, Paul and Erclentz under Flugge³ in Breslau, confirming those of Angelici, Reichenbach and Heymann,⁴ and reconfirmed by those of Hill⁵ who worked independently, sanitarians agree that the most disagreeable and dangerous effects of vitiated air proceed in preponderant measure from high temperature, humidity and stillness of the air that preclude the normal loss of body heat, humidity and stillness lessening the evaporation of healthy perspiration. Rosenau and Amoss⁶ have found certain protein matter in expired breath through the reaction of anaphylaxis, which may or may not be harmful. It is also possible, as suggested by Weichardt,⁷ that there are other poisons, and it may be that although carbon dioxide does not seem to have a deleterious effect even in relatively large percentages, notably as high as 3 per cent. with as little as 15 per cent. of oxygen, when breathed for limited periods of time (see the work of Hermans⁸ and Lehmann⁹) it may decrease the general vitality of the individual if breathed continually for long periods. Rosenau (*op. cit.*, p. 644-50) gives very complete notes of the literature of the investigations on this subject.

It is evident that the dangers just described are vastly lessened if large openings to a room directly admit air from outside. While the degree of saturation varies considerably with the atmospheric condition at different times of the year and on different days, it seldom reaches such extremes as are often found in closed rooms. Furthermore, the air is almost continually in motion, which facilitates the elimination of body heat. Lastly, the continued change of air carries away infectious dust so that the dilution is very great. We may therefore admit, without question, that for class-rooms where children are predisposed to or already afflicted with tuberculosis, the rapid flow and change of air must necessarily be far more

beneficial than the ordinary and even the best forms of so-called artificial ventilation.

In the ordinary school-room of generally approved construction, the actual glass area varies between 20 and 25 per cent. of the floor area of the room.

Dresslar,¹⁰ advises an east or west orientation for the rooms. Many school houses are so prescribed, by the site on which they are constructed, that a northeast exposure results. Therefore, the area through which the sunlight passes will only be a small proportion of the floor area, and that portion of the floor or room covered by the sunlight will be still smaller as the angle of the sun is farther from a perpendicular to the plane of the window. Sunlight is one of the most active and satisfactory germicides that we have; but the rays that are effective are the blue-violets and ultra-violets, two or three hours' sunning being required to kill tubercle bacilli under ordinary conditions, while the spores of all bacilli are much more resistant than the cells. Diffused light will also kill bacteria, if strong enough, and it retards their growth; but a much longer period of time is required, and the red and yellow rays of sunlight and other origins are valueless. Unfortunately, the ultra-violet rays, which have the most powerful germicidal action, are screened by glass, so that sunlight passing through a window closed by glass, not only has the intensity reduced, but the most efficient part of the light is eliminated. Unless light is so generally diffused in a class-room that there can be no shadow, the light should be unilateral and come from the left of the pupil. In any event, it is better to have a stronger light from the left, and light behind the teacher should be eliminated. For this reason, it is evident that parts of the ordinary school-room must necessarily be sequestered from the disinfecting power of the sun's rays and even from such diffused light as would be beneficial.

In the open school, with light coming from many directions, it is much more possible so to arrange the open portions of the room that sunlight and strong diffused light will disinfect it, and absence of glass will give full scope to the disinfecting power of light.

The accepted school-room of the past has brought the outdoor air into the room laden with fine dust. This dust settles gradually, after its entrance to the room, while the air leaks away through cracks or passes out by the vent ducts. As children move around the room, the dust is stirred up, unites with the chalk dust from the blackboards, and irritates the respiratory passages, making them more susceptible to the attacks of bacteria, and, in certain cases, infecting them, providing the dust itself has become infected.

In some of the more modern schools with better equipped systems of ventilation, dust screens form part of the equipment, so that the air that is introduced into the school-room is cleaned; but

less dust passes out of the old-style room than the sum of what comes in and that manufactured in the room.

In a dusty neighborhood, with class-rooms opening on a public thoroughfare, it is possible that open rooms on the lower stories might become receptacles for a considerable amount of dirt. Such situations, however, should not be selected for open-air rooms, and usually it will be found that the dilution out of doors is far greater than in a class-room under the best conditions.

The foregoing brings us to the end of the first stage of our study, and it is evident that, from the point of view of the quality of the air, the effect of sunlight and of minimizing the quantity of dust, open-air schools are far superior for tuberculous children.

Increase of Resistance.—An accepted temperature of the old-style school-rooms has been 68 to 70° F. School-children seem perfectly comfortable in temperatures varying from 20 to 30° below this, and as is shown by the reports procured for the latter part of this paper, the officials in a number of schools have found that they are entirely at ease in zero or even colder weather when proper care is taken to clothe them adequately and to vary the periods during which they are seated, with other periods when they move about.

In describing the different conditions of lowered resistance that lessen immunity, Rosenau (op. cit., p. 351) refers, among the first, to "exposure to wet and cold." Neither the old-style nor the open-air school-children are subjected to wet clothes in well-conducted schools, as damp garments are removed as soon as they reach the school, and dry ones substituted. Greater care is usually taken with children of outdoor schools than was formerly the case in the old-style schools. Rosenau (op. cit., p. 352) quotes Emery¹¹ in summing up our knowledge upon this subject. Emery points out that as immunity is to a very large extent a function of the leucocytes, their movement together with phagocytosis being dependent in a high degree on temperature, where a local cooling occurs, the leucocytes, in their repeated passages through a cold area, probably suffer a diminished functional activity. Furthermore, while the body tends to make up its loss of heat, there may be a slight diminution of the general heat which would also tend to depress the functions of the leucocytes. He furthermore says there is some evidence to show that cold may lessen the production of the defensive substances, such as alexin, antibodies, etc., and he adds that "it is worthy of note that the loss of immunity due to the action of cold and wet on one part of the body (such as the feet) is a general one, and may result in a nasal catarrh, an attack of pneumonia, acute rheumatism, etc. according to the nature of the infection at hand. It is not necessarily a local infection of the chilled region. This is very well shown experimentally. Fowls are immune to anthrax, but are rendered susceptible if they are kept for some time standing in cold water;

and this acquired susceptibility is then a general one, and not merely of the feet.

"Cold and wet, as is well known, have less action when accompanied by energetic muscular exercise, so long as this does not reach the extent of undue fatigue. . . . The effect of fatigue, either alone or in conjunction with cold and wet, is also well known. . . . It is less explicable, but may probably be connected in some way with the presence in the blood of katabolic products of muscular activity, which have an injurious action on the cells of the tissues in general and on the leucocytes in particular. Further, the metabolic products formed during the action of the muscles are acid in reaction, and it is found that some at least of the protective substances which occur in the blood (alexins and opsonins) act best in alkaline medium." From this, it is evident that if children are allowed to become cold, and if, in addition to this, they are allowed to become fatigued, their immunity will be lessened, and the balance thrown so that invasions of any infectious germ present will be facilitated.

In contrast with this, Rosenau (op. cit., p. 641) says "fresh air is nature's tonic. It stimulates digestion, promotes assimilation, improves metabolism, strengthens the nervous system, and increases our resistance against some diseases. It is a common experience that fresh air gives us a general feeling of well-being. Much of the benefit of an outdoor life comes also from the exercise, diversion, sunshine, and other factors. The stimulating effect of outdoor air varies considerably with the temperature and movements of the air. Cold air is especially stimulating, and much of the good of sleeping out of doors is perhaps secondarily due to the tonic action of cold. Sleeping out of doors or with open windows atones for much bad air during the daytime." He closes the paragraph with the significant statement: "However, the good results of fresh air may be neutralized by undue exposure to cold, especially in the young, the aged, and the feeble—or even in robust individuals not properly protected. 'We may write and talk as much as we please about the horrors of bad air and the importance of fresh air, but we should never induce people to sit in cold drafts and shiver for the sake of pure air, and, in fact, we would not want to do it ourselves' (Macfie). Extremes in this as in all matters hygienic are to be avoided. It is important that those who sleep out of doors or sit out should be warmly clad and sufficiently fed."

To sum up this point, it is evident that the open-air school, and especially the *cold* open-air school, will fortify the individual, and that this strengthening of vitality will continue up to the point where he begins to feel discomfort from the cold. Beyond that point, the cold becomes a menace that over-balances the value of the fresh air itself. Fatigue adds to this menace.

I want, therefore, to impress upon the physicians in charge of our

open-air schools, and upon such teachers as may chance to read this article, that it is not sufficient to place their children out of doors. In cold fresh air, they have between their hands a tool of greatest value for improving the condition of their wards; but the tool is a sharp one and the dangers of using it carelessly are greater than is recognized by some of those who understand the value of open-air schools.

It is a common experience to find that those suffering from tuberculosis gain in weight in the winter and only maintain a level in summer. Probably this is partly due to the fact that the cold stimulates to activity at the same time that it necessitates a greater combustion, so that patients have a better appetite. In the case of tuberculosis, it does not necessarily follow that a disproportionate increase of weight predicates a decrease of disease; but any slow gain is an indication that the general power of recuperation is being maintained. It is evident that this gain cannot be accomplished without adequate food. Since in an open-air school in a cold climate, the temperature is sure to be much lower than is ordinarily maintained in the homes of the children or in the ordinary school, it is evident that an increased supply of food must be taken in by the children, and that this food must make up for the additional number of calories translated into body heat and given off. Therefore, while we may reasonably admit that the children will eat more and that their general condition will be benefited by the stimulant of cold, it is vital that the loss be amply made up, and that the foods be selected and administered in such a way that they will supply the deficiency. In passing, I wish to quote again from Rosenau (*op. cit.*, p. 460) and underline his statement "that no substance is a good food unless it fulfils two conditions—namely, easy assimilation and complete combustion. It is not sufficient to know merely the amount and caloric value of the coal fed to a furnace, and subtract therefrom the amount of unconsumed ash. We must know how much of the heat generated has been utilized." I find that in many open-air schools this principle is understood, and that three meals of carefully selected and very nourishing food are given to the children in addition to the meals they have at home in the morning and at night; but I also find that, in a number of schools—some of them for anemic and predisposed children and even for incipient cases of tuberculosis—a single meal is given where economy seems to be the guiding factor, and in certain schools no additional fuel makes up for the increased combustion. If adequate nourishment of predisposed and tuberculous children absolutely cannot be carried out, it might be safer to take less heat from them and keep them in what is called a low temperature room, rather than in a definitely outdoor classroom in very cold weather.

In saying this, I do not wish to imply that I consider that the free outdoor school, with no heat in the class-room, should be dis-

carded even in cold latitudes, provided the continual warmth of the children is rigorously maintained, and their nutrition is amply sustained. It is evident to anyone that protection from driving storms, strong winds, etc., must be assured.

A distinct advantage of the open-air school is that the nourishment of tuberculous and anemic children is more likely to be supervised than it would be if they were in the ordinary school and depended largely upon home care for a selection of their foods. It is the advantage of the sanatorium over treatment in the home.

Terman,¹² in his excellent treatise that he has just published on "The Hygiene of the School-Child," emphasizes the point of school feeding and even would extend this to apparently healthy children. In his chapter on malnutrition, after reviewing the arguments against school feeding, he fortifies his own point of view with statistics from all the larger countries in Europe, showing how far we are behind the older nations in this respect.

A point about which I wish later to stimulate inquiry—namely, the question of which the outdoor school is, in all circumstances, the best preparation for future life, is not, in my estimation, pertinent when we are considering children who are trying to recover from infection. In their cases, remedial measures are paramount, and under proper medical direction, if they regain perfect health, transition to the surroundings of their future occupation or selection of a particular occupation that may be suited to their capabilities will be possible.

There is one other point to which reference must be made, although it is in such an incomplete stage of investigation that I do not feel secure in treating it. A gas which has the chemical formula $C_{10}H_{16}O_3$ and is called 'turpezone,' has been tried experimentally under varying conditions. There is a possibility that, under certain conditions, it may be substituted with advantage for open air. On the other hand, it can be administered in the open air; but the methods of this administration, with which I am conversant, would not be applicable for school-children at their studies. What I know of the experiments in the use of turpezone, has not, as yet, made me believe that its use will abolish open-air schools even for children who are markedly tuberculous; but it would be improper not to keep in mind the fact that investigation of this subject is under way. Furthermore, a new line of inquiry is attracting attention and study—namely, certain altered conditions or qualities of the oxygen in country air which it is believed, in some quarters, are the life-giving properties, and the possibility of duplicating these conditions or qualities artificially. There is a possibility that this may also influence the designing of open-air schools.

Before leaving this section of the discussion, I want to note a few points that should be observed in the designing of schools

specially affected to the use of tuberculous children. For a number of years Corwin,¹³ Chief Surgeon of the Colorado Fuel and Iron Company, has ardently promoted what he terms the 'unit plan school.' Although it is not apparent why the benefits of such a scheme might not be fully realized for the average child by a less extravagant outlay from the point of view of space than is shown in the majority of the plans in Corwin's pamphlet, it is evident that for exceptional schools, and especially for those assigned to tuberculous children, such a unit or cottage type would be ideal in a country where grass and distance from a public road can obviate the entrance of dust, providing the climate is dry enough and the soil sufficiently absorbent and free from clay to make reasonable a placing of the class-rooms near the level of the ground. It might be possible to raise the class-rooms over a high basement; they would materially benefit thereby.

In schools for tuberculous children, it would be wise to sacrifice the effort to bring about a preponderance of unilateral sinistral light in favor of windows that would flood the floor with sunlight, so that on any sunny day the whole area or the majority of the area could, at some time, come within scope of the sun's rays.

Special care should be taken that the wardrobes be ventilated and sun-bathed in peculiar degree, and if no heat is supplied to the class-room, that there be a room where such children, as are becoming chilled, may find opportunity to be warmed. A danger that must be recognized is the change of temperature without corresponding change in the coverings of the children. For tuberculous children it may be more difficult, in some cases impossible to substitute for artificial warmth of this kind the natural warming of the body through rapid exercise, and in numberless ways, that any physician will appreciate, differentiation must be made in the application of the open-air school when invalids are concerned.

In the general finish of class-rooms all of the requirements for a sanatorium should be observed, notably rounded corners, washable walls and floors, absence of projections, etc., and in place of blackboards, ground colored glass and hard talc, or, better yet, ground light or white glass with a dark pencil or crayon should be substituted in order to minimize the dust. At the bottom of the blackboard, below a netting, the chalk tray should be a wide trough, preferably porcelain enameled iron, filled with water containing a disinfectant so that the falling dust may be immediately moistened. This water should be changed every day. When the temperature is below 32° F., the liquid will freeze unless chemically treated, so the trough should be rounded to permit of the increased volume of the ice. For an interesting discussion of blackboards, see Dresslar's "School Hygiene," pp. 41-49.

Another very important point that is almost universally overlooked is that of screens and nettings. It is exceedingly important

that insects, flies, gnats, mosquitoes, bugs of all sorts should be excluded from any room and especially from a room where there are children exuding infectious secretions. Such small animals not only bring germs with them, but they light on the exposed portions of the anatomy and clothes, mingle with the dust and carry germs from one part of the room to another. Wherever there is food, they seem ubiquitous.

Many authorities now hold the view that, in a large proportion of cases, the portal of entry of tuberculous infection, especially in children, is by ingestion. This proportion is not accounted for by contaminated cow's milk. Rosenau (op. cit., p. 131) cites the views and experiments of Vallée, Whitla, Symmers, Weichselbaum, Bartel, Neuman and Spieler, which all tend to prove that infection occurs either through the alimentary tract and mesenteric glands, with an added large percentage of infection through the cervical and bronchial glands, the bacilli passing through the lymphatics, the thoracic duct and arterial circulation to the lungs and other tissues and organs of the body, rather than by direct investiture in the lungs, the disease only localizing itself in the lungs later on, because this organ presents the least resistance.

Nettings should enclose the entire opening with the greatest possible reduction of transverse bars which would act as repositories for dust and would render the view less attractive. The netting should be either galvanized iron, unpainted, or copper, and should be not coarser than No. 20 mesh. The netting should be carefully cleaned by dusting first and spraying afterward with a disinfectant at intervals of not more than a few days.

In the conduct of the school, peculiar care should be taken that there be no community articles. Each child should have its own sleeping bags, wraps, desk, books, pencils, pens, erasers, paper and blackboard chalk or talc. The last named is often forgotten. Furthermore, dishes, cups, etc. should be carefully sterilized. Each day the blackboards should be carefully cleaned and disinfected, as children are likely to sneeze or cough against them and the dust particles are likely to be blown about the room. In an article¹⁴ published lately full of valuable suggestions, Knopf gives a list of simple rules for school-children to prevent tuberculosis.

Experience shows that cots, allowing the children to stretch out flat, are much better than reclining or steamer chairs. For tuberculous children, milk, raw eggs, and fatty foods are important articles of diet, and watery soups are not to be recommended, although hot food is advisable, the heat acting as a stimulant.

Warren,¹⁵ after urging a careful balancing of proteids, carbohydrates and fats, makes a very reasonable plea that the appetites of the children be used as a guide, and they be trained gradually to eat those things which are the best in the judgment of recognized dieticians. "Habits of life of the child should not be suddenly

changed. Many children must be trained before they can eat enough of strange dishes to maintain their body weight and growth, and, if forced at once into a recognized standard, would lose in weight."

Tooth-brush drills should be instituted for all children, but become particularly necessary for the tuberculous. Head, of Philadelphia, makes an important point¹⁶ when he says: "Since the tooth-brush cannot cleanse between the teeth, these surfaces should be swept free from bacterial deposits with floss silk, morning and evening. It needs but slight consideration to bring conviction that this is just as important as brushing; but it is seldom carried out." Powders that develop peroxide have now been placed upon the market and are valuable complements to the exercise of tooth brushing. Dr. Head gives the following formula:—

Magnesium peroxide (200 mesh sieve)	60 parts
Sodium perborate	30 parts
Castile soap and flavoring	10 parts

Although practice varies in the point at which children suffering from tuberculosis are eliminated from the class and prescribed complete rest, some physicians taking a temperature of 99.5° F. as a gauge, while others do not exceed 99° F., it may be wise to note that a limit of this kind should be set and that it is better to place the limit low rather than too high.

Giving due weight to all of the foregoing points, I think we may sum up the whole situation in favor of the frankly open-air school without heat of any kind in the class-rooms for tuberculous children, even without reference to the authenticated reports which are confirmed by the latest evidence obtained for this article, which all go to prove that open-air schools are by far the best solution for the reconstruction, not only of tubercular children, but of anemic and predisposed children of all classes.

Children in Normal Health.—In "Open-Air Schools," a pamphlet issued by the Russell Sage Foundation a year ago (E-134, p. 3), is the following significant paragraph: "Fresh air for all children is the next step. Educators and parents are beginning to ask why, if open-air schools are of such benefit to ailing children, they should not be even more beneficial to healthy children. A child should not need to be diseased in order to secure abundant fresh air and warm sunshine."

The purpose of the present article is to treat the relation between open-air schools and tuberculosis, and if such schools lessen or increase the number of healthy children who would otherwise become tuberculous—and they must exert an influence one way or the other—the present paper would be incomplete without consideration of this part of the question.

All the points touched upon in discussing schools for tuberculous

children, repeat themselves in a certain degree for those built for healthy children.

Normal children will not tire as rapidly as invalids, may not need quite as long rest periods, and may be able to sustain slightly longer study periods; but although there are some forms of exercise and activity that may have to be excluded, in general it is the degree and not the kind of occupation that is modified.

It is not sufficient to inquire whether the open-air school is of immediate benefit, but rather is it of lasting benefit, and does it fit the children for the greatest possible productiveness and increase not only their present but their future immunity and decrease the eventual number of the tuberculous? If a certain proportion of children are saved during their youth, they will live to increase the proportion of useful citizens later in life. On the other hand, if not only those saved but the total numbers of those coming to the middle years of life reach that period in a condition that renders them in some degree unfit for their surroundings and occupations and less able to cope with and resist the attacks and inroads of disease, the balance may be thrown to the other side and a final loss to humanity result.

For a number of reasons, not all of which are clearly understood, we with other animals are not only fitted by heredity but are developed by environment to adapt ourselves to specific conditions.

Considering the matter from the point of view of heredity, we should conclude that although an actual change (resulting from evolution through natural selection or, in accordance with Mendel's law, through the strengthening of mutations within the limited number of hundreds of years that have brought the human race from its former open-air existence to its present confined and specialized existence) might not be sufficient to prevent a rapid reversion, this reversion of the mass of humanity will not occur in one generation. The greater number of occupations of the present day are necessarily indoor, and, to a certain extent, confined occupations, and in cold climates many of these occupations must remain enclosed and confined. Possibly a shortage of coal in the next century or so may introduce an economic factor that will bring about a more open-air life with greater reliance on body covering; but at present by far the larger number of the children, who are about to grow to manhood in the cities of the United States, will be forced to live and find occupation in more or less enclosed areas. Great numbers of human beings at the present time in civilized countries have, for generations, been accustomed to this protection, enclosure and confinement. Furthermore, the individual who may be treated to one kind of existence through all of the years of infancy and adolescence does not readily readjust him-

self to an entirely changed condition even though such readjustment may, in many cases, be attained.

In addition to this matter of general predisposition, another quality of immunity should not be lost sight of.

In his opening address to the National Association for the Study and Prevention of Tuberculosis in 1911,¹⁷ President Welch suggests that not only are most human beings infected with tuberculosis at one period or another of their existence, but that such infections are a protection against the effects of renewed inoculation with tubercle bacilli both from without the body and from within. He first gives Nægeli's figures, confirmed by Buckhardt, Hamburger, Monte and other investigators, showing that upward of 90 per cent. of human beings, at any rate in the focal points of our cities, have been infected with tuberculosis in the early years of life. In other words that "infection with the tubercle bacillus is practically universal by the time adult life is reached." He goes on to show that in animals such inoculation greatly increases the immunity of the subject. "On account of the high degree of susceptibility of guinea-pigs, it requires special methods of inoculation and small doses of tubercle bacilli to demonstrate readily the protective influence of an existing tuberculous infection of limited extent to reinfection; but such demonstration has been conclusively brought by Rømer and by Hamburger. Particularly impressive and convincing are Rømer's experiments with the tuberculous reinfection of sheep, which more closely resemble man in their sensitiveness to tuberculin. These animals may be rendered, by a localized tuberculosis, completely insusceptible to the subsequent intravenous injection of quantities of bacilli which kill the control animals in a few weeks with generalized tuberculosis." Anaphylaxis is induced and although this may have a regrettable side in case large doses of the bacilli are later introduced, the condition of immunity is undoubtedly increased. Welch does not go to the length of suggesting that these slight infections should be sought. He acknowledges that much experimental study is necessary before a satisfactory understanding of the pathogenesis of pulmonary phthisis can be reached. He says that we need hardly occupy ourselves with such a method of securing protection, inasmuch as we are all likely to be subject to such infection. In that the forms of tuberculosis, which appear in the first two or three years of life, are predominantly fatal, they should certainly be prevented wherever possible, but he does not on the whole consider the lighter infection of the period with which we have to do in school-children as without a beneficial side. Whether or not such infections and early immunity play a large or the principal part in the difference between the susceptibility to tuberculosis that seems to be shown between human beings and animals that have been brought up in the wild and are later brought into a congested district

and those who have actually been brought up in the district, it is not without interest to consider this general fact. Susceptibility to a disease in a mass of human beings may disproportionately manifest in an uncivilized community that has never had the disease, because if the disease had been prevalent, those who were susceptible would have been killed off. In spite of this view, there is sufficient evidence at hand to warrant a belief that there is a marked difference in the susceptibility to disease between those who have and who have not been reared in surroundings that predispose the novitiate to or infect him with the disease.

In an article describing the pathological effects of captivity on wild animals,¹⁸ Harlow Brooks says: "The general characteristics of the lesions produced in simian tuberculosis correspond very closely to those of the human, and the bacilli found also simulate morphologically those of the human infection. No comparative biological tests have, however, yet been made by us. Chronic tubercular lesions are much more infrequent in the monkey, and the pronounced fibroid changes of pulmonary phthisis as seen in the man have never been observed by me in the monkey. Neither does one frequently find healed tubercular lesions in the tissues, particularly in the lungs of these animals, as in man. In man, dying of other than tubercular disease, healed tubercles are present in from 50 to 80 per cent. of cases. I infer from these facts that the disease is of a much more virulent form in the monkey, and that the rule is death in infected animals, while in man the average case recovers. This observation may be likened to the characteristics of the disease when it affects a primitive people, particularly one in which tubercular infections are infrequent in their natural habitat; we may thus compare the primate tuberculosis to that of the Indians, of the Esquimaux, or even to that of the negro, in his native land. From this line of reasoning it appears that we shall eventually find that the offspring of monkeys in captivity are less liable to succumb to the infection than those direct from the jungle, that is, of course, assuming the conditions of infection and environment to be the same."

Miller makes a somewhat similar comparison.¹⁹ Speaking of another disease he says that it "proves most conclusively the frequent tendencies of disease well known and of little moment in domestic animals to be the means of great loss when attacking wild animals in collections." Further than this, I think an interesting deduction may be drawn from the fact succinctly set forth by no less an authority than Dr. S. A. Knopf, of New York,²⁰ when he says: "The native locality of the tuberculous must be taken into consideration when making a climatic change. The patient who spent his early youth in Norway or other parts of Northern Europe or one born in Massachusetts, Minnesota, or New York where the winters are rigorous, will usually do better in such cli-

mates as Colorado, the Adirondacks, Sullivan County or Orange County of New York. The sons and daughters of sunny Italy and Americans born in the warmer zones will do better in climates such as are to be found in Southern California, New Mexico, Arizona, North and South Carolina, Virginia, Florida, Bermuda, etc., and farther on he says: "If the patient wishes to return to his former home after improvement or restoration to health, may he do so safely or not? Experience has shown that when great climatic changes have been made, patients frequently have relapsed on returning to their former home."

I have not brought forward the foregoing to express a conclusion, or to imply that I do not believe in open-air schools with unheated class-rooms for normal children. The opposite is the case.

Nevertheless, as I remarked at the beginning of this article, we have not yet had a long period of years in which to test the open-air school. When we have, although pupils would undoubtedly gain in hemoglobin, weight, power in the assimilation of knowledge resulting from less tendency to fatigue than in the old-style school—all of the benefits described in "Open-Air Crusaders,"²¹ a small book that I cannot recommend too highly—it may be possible that if the extreme were pushed *too far* and if children not only studied in an open-air school, but lived their entire lives in contrast with those of their fellow human beings, on reaching manhood and entering the confined surroundings of the usual avocations, their constitutions would be so ill-adapted to the restrictions and attacks of pathogenic organisms that they would succumb. I know of certain cases where children have been brought up entirely in the open because belief in out of doors had become a fetish to their parents or guardians. This is an extreme that I think unwarranted for those in a normal state of health and that may even be deleterious, paradoxical as this may sound.

An important function of the open-air school, of which we must not lose sight, is the influence that it may have on the community. No greater object lesson can be found than the bright rosy-cheeked children whom we see coming from those that have already been instituted and that are conducted in an intelligent and 'common sense' manner. They have already proved missionaries of fresh air to homes that were formerly 'hot beds' (in an actual as well as a figurative sense) of disease. The regenerated home will finally impress itself upon a regenerated community, so that when these children become adults, they may find a less distressing and dangerous difference between the lives they have learned to lead and love and the confinement forced upon their forbears by an unhygienic and unheeding social machine.

EXPERIMENTAL DATA.

As previously stated, I have sent out inquiries to about two hundred open-air schools, a list of which is appended at the end of this article. These are situated in eighty-six different cities, and I have had answers from about ninety of them.

I think it would not be amiss to remind the medical directors and inspectors of such schools, that where investigations of this nature are being made, it is of the utmost importance to the investigator that prompt and full replies be sent in, and that these answer all of the questions that are asked. We are all of us busy, but the time devoted to such response is in the interest of science, and bread cast upon such waters is sure to return. Other investigators have told me of the difficulty they experience in obtaining answers.

On the other hand, I wish to express my very deep indebtedness to the men and women who took time from their many duties to furnish information. Some of the answers were very full and unusually helpful, giving comparative hemoglobin tests, weight tests, numbers of meals, menus, etc., with other data that not only are helpful for the work in hand, but are stimulating in suggesting other lines of inquiry, investigation and study.

I find that, of the total number of schools in the country, about 10 per cent. are for normal children, 75 per cent. for anemic children, and, in some cases, for those that are predisposed but with no marked symptoms of the disease, while 15 per cent. are for tuberculous children. The last named division includes a certain number of schools that are for bone and gland tuberculosis without admitting any cases of pulmonary tuberculosis.

While it is advantageous for social economy that there be preponderance of schools for anemic and incipient cases over those for cases in which the advance of the disease has become marked, it seems regrettable that there should not be an even larger proportion of schools for normal children.

Although a number of those that are subnormal or weakly have undoubtedly been so from infancy, or on account of very early lack of nourishment and care, there is a marked proportion that retrograde during periods that occur after they enter school. Just as care of the anemic and predisposed children lessens the number of those advanced in tuberculosis, so the open-air school for the normal would doubtless greatly lessen the number of those who would become anemic and develop incipient tuberculosis. Probably one reason that the proportion of schools for normal children and for anemic is so markedly in favor of the latter, is that the movement is in its infancy, and the medical profession has made more effort for invalids than educators have for normal children. I have no doubt that this proportion is rapidly changing.

Another interesting comparison that has been shown beyond a doubt by my canvas, is that there is a larger proportion of schools having no heat in the class-rooms than of those having class-rooms somewhat warmed. In other words, 57 per cent. of the schools are entirely without class-room heat, and only the remaining 43 per cent. are what have been termed 'low temperature rooms.' In some of the latter, the heat is allowed to be turned on up to a limit of 65° F., which is unusually high. It is probable that the number of schools excluding heat is increased above what the figures indicate on their face, by the fact that California and a certain number of Southern States have rooms where heat would be unnecessary even from the standard of those who believe in a 'low temperature' room.

From the descriptions I have received of the schools, it is apparent that some of the class-rooms that are considered outdoor or open-window rooms, have windows only on one side; inadequacy of this provision is evidently recognized by the majority.

A large number of the schools for defined cases of pulmonary tuberculosis are in sanatoria, and an opinion expressed by the officers where recognized or advanced cases of tuberculosis are excluded—namely, that "a school is no place for such a case," may be very reasonably admitted if by 'school' we mean only places of instruction for children who are not tuberculous. It would be a pity, however, that no place of instruction be provided for well-defined cases of tuberculosis, and the children forced to remain in unhealthy tenements, while they might be taught and furthermore be cured instead of dragging on through a short number of diseased and contaminating years to a premature death.

Although my data are not entirely complete on this point, I should say that a large proportion of the schools furnish the children with some additional food, and a number of the schools furnish a dinner and two luncheons. In New York City, a luncheon was furnished up to the present year, 1913-1914, but has not been furnished this year. I find that in a few schools where no food is furnished, there exists a strong feeling that none should be provided. Dr. Walter W. Roach, of Philadelphia, voices this in his report to me, accompanied by an article that he published lately in *School Progress*.²² Dr. Roach says "these children are not led to believe that they are weaklings, but are encouraged to breathe properly and exercise judiciously and sleep with open bedroom windows and eat slowly so they will grow strong and they *do* grow strong." The article further states that "none of these children was fed at the school." It compares two groups, one of which was taught in the ordinary school-room and the other in an open-window warmed room where the temperature was rarely allowed to go below 45° F. The two classes were evenly balanced, and given two teachers of as nearly equal merit as possible. The children were

weighed each week and the test was continued for over three months. During this time, the average gain in weight of the children in the open-window class of both girls and boys, was 2 lb., the class numbering forty-five, twenty-five boys and nineteen girls. There were eighteen physically subnormal in this class, and the subnormal children seemed to gain in about the same proportion as the others, except that the subnormal girls' gain, being slightly more rapid, showed an average increase of 2% lb. In the warm air room the average gain was slightly under 1 lb. during the same period. Dr. Roach also says, in speaking of the open-window classes, "tests made of their school work in spelling, arithmetic and memory work, show that the fresh-air children have the decided advantage. The latter are more alert and entirely free from day-dreaming, quicker to learn, more regular in attendance and require less discipline than their fellow pupils in the warm air classes."

When I questioned Dr. I. Ogden Woodruff, of New York, on the matter of feeding, he stated that although school feeding was advantageous, he had found, from experience, that the children gained after being put in the open-air classes, whether they were fed in school or not.

I do not mean, by the foregoing, to imply that either Dr. Roach or Dr. Woodruff would fail to advocate exceptionally nourishing and abundant food for these children. Doubtless the attitude in Philadelphia, where there appears to be some antagonism to school feeding, is that the parents of these normal children would be led to rely on the Board of Education in the matter of nourishment and would not do their duty if the Board assumed a prerogative that by rights belongs to the parents and should not be foisted upon other taxpayers.

They also undoubtedly rely on nature to take care of herself. If the children become hungry because they are out of doors, they will demand more food and get it at home if it is not supplied at school. Nevertheless, it is frequently the case that children are forced to go for excessively long periods, between breakfast and dinner, without an intermediate luncheon that nature craves but that the children are not old enough to know how to demand.

In Boston, another system prevails. The children are encouraged to bring a luncheon with them, and additional food of some kind is provided at a small cost. In certain schools, they are required to procure something hot—soup, chocolate, etc.

Just as superalimentation is one of the most important factors in stemming the advance of tuberculosis in the individual when under treatment as a patient, so it is for those in the early stages who are predisposed or tuberculous, and in school, instead of in a clinic or sanatorium.

As we saw in the theoretical discussion of this subject, outdoor

life will bring about greater power of assimilation and greater need of fuel supply.

It is difficult to say just where paternalism should be excluded and it would seem wiser, in the case of all children where the disease has announced itself in any way, to forestall a greater expense in the sanatorium or hospital by supplying requisite nourishment in anticipation.

Finally, I have found that in a few schools there is lack of medical supervision. For normal children, such supervision is not so important; but I do not believe that even the ordinary school should be without regular medical inspection, and when it becomes an open-air school, such supervision should never be dispensed with. Careful comparisons of the weights, gain in hemoglobin, and gain in mental power of the children, should be recorded and filed for comparison.

It would be of great value if more experiments, ranging over long periods of time, could be made in emulation of those made by Dr. Roach and in a few other districts. If such were instituted in different parts of the country so that results in California could be compared with those in Pennsylvania and New York, control warm-air classes being compared with open-air classes, and with 'open window' or 'low temperature' classes, all under carefully balanced conditions, some certain knowledge could be adduced.

The most encouraging thing that is shown by the canvas just made is the continued growth in number of open-air schools. It not only means that fresh air in the school has come to stay, but that fresh air in the home and in the community will soon be on the increase. Those who have slept out of doors usually refuse to return to a stuffy bedroom, and we may feel well assured that as the children of the present generation grow to manhood and womanhood, they themselves will insist on fresh air, not only for themselves but for their children and their children's children.

LIST OF OPEN-AIR SCHOOLS IN THE UNITED STATES.
JANUARY, 1914.

California: Alameda; Chila Vista (Valois Butler, Clerk); Fresno; Long Beach; Los Angeles; Monrovia (Rev. Clark Marsh, Member School Board); Oakland, Fruitvale Open-Air School (N. K. Foster, M. D.); Pasadena; San Diego; San Francisco; San José.

Colorado: Colorado Springs; Denver, McKinley School (Clara J. Coney, Principal), Park Hill School (Rufus Palmer, Principal), Robt. W. Steele School (Alfred E. Hoel, Principal).

Connecticut: Hartford (Henry F. Stoll, M. D.); New Britain, 38 Bassett St. (W. W. Brackett, M. D.); New Haven, Edwards St. School (Anne K. Joslin, Principal), 73 Ward St., H. Merriman Steele, M. D.; South Manchester (T. G. Sloan, M. D.); Waterbury (Ella Young Goss, Principal); 70 Hillside Avenue, J. E. Farrell, M. D.

Delaware: Marshallton, Hope Farm Open-Air School, Wilson Pendleton, M. D.

District of Columbia: Blake School, E. L. Thurston, John L. Norris, M. D., and Wm. C. Woodward, M. D.; Stevens School (Colored), E. L. Thurston, Teacher, John L. Norris and Wm. C. Woodward, M. D.

Georgia: Atlanta, Battle Hill Sanatorium, S. Wickes Merritt, M. D.

Illinois: Chicago, Elizabeth McCormick Open-Air School, No. 1, 818 Ewing Street, J. A. Bretton, M. D.; Elizabeth McCormick Open-Air School No. 2, 1153 Gault Court; Elizabeth McCormick Open-Air School No. 3; Elizabeth McCormick Open-Air School No. 4; Graham Open Window School, Dr. Wm. E. Watt, Principal, D. B. McEachern, M. D.; Franklin Open Window School, No. 2, Goethe St., between Wells and Sedgwick Sts., Miss Etta O. Gee, Teacher, O. W. McMichael, M. D.; Hamline Open Window School, 48th and Bishop Streets; 14 Open Window Rooms, under direction of The Elizabeth McCormick Schools; Foster School Open Window Room, Union and O'Brien Streets, Bert I. Wyatt, M. D., 5746 Calumet Avenue; Mosely Open Window Room, 24th St. and Michigan Ave., John A. Long, Principal, H. O. Jones, M. D.; Maywood, Mrs. Chas. E. Blake, 408 South 2nd St.; Oak Forest, Miss Skinner.

Indiana: Indianapolis, Lucretia Mott School, North Rural Street.

Iowa: Oakdale.

Kentucky: Lexington, Lincoln Open-Air School, West High Street, George Wilson, M. D.; Louisville, Audubon Open-Air School, 2nd and Grey Sts., Carleen E. Proehl, Teacher; Waverly Hill Sanatorium Open-Air School, Lora Brooks, Nurse, 121 N. Chestnut St., Dunning S. Wilson, M. D.

Louisiana: New Orleans, McDonagh School No. 9, Miss L. C. Whitaker, Woodson Moss, M. D., Henry W. Allen, Miss Marie Kronenberger, Teacher, Woodson Moss, M. D.

Maryland: Baltimore, Armdell School, Elizabeth M. Carroll, Teacher; Bryn Mawr School, Mary Sherwood, M. D.; Public School No. 76, Persis K. Miller, Teacher, H. Warren Buckler, M. D., 806 Cathedral St.; The James L. Kernan Hospital and Industrial School, 2000 N. Charles St., R. Tunstall Taylor, M. D.; Roland Park, Gilman Country School; Sabillasville State Sanatorium, Victor F. Cullen, M. D.

Massachusetts: Boston, 14 or more Open Window Classes in different public schools; Curtis-Peabody School, Elizabeth Curtis, Teacher; Brookline, Parsons School, Grace Howard Manter, Teacher, R. M. Hastings, M. D.; Cambridge Fresh Air School, Miss Anna F. Butler, Teacher, W. E. Fleet, M. D.; Chelsea, Shurtleff School, Edw. J. Powers, M. D.; Williams School, George B. Fenwick, M. D., 259 Chestnut St.; Holyoke, Francis McSherry, Supt.; Northampton; Springfield, R. B. Ober, M. D.; Westfield State Sanatorium, Henry D. Chadwick, M. D.; Worcester, R. H. Mooney, Principal.

Michigan: Detroit, Nellie Leland Open-Air School, Miss Maude Van Syckle and Miss Kathleen Craigie, Teachers, V. C. Vaughan, Jr., M. D.; Marr Open-Air Public School; Russell Open-Air Public School; Stevens Open-Air Public School; Herman Kiefer Hospital; Grand Rapids, Open-Air Class, West Leonard St. School, Tuberculosis Dispensary of the Grand Rapids Antituberculosis Society; Pleasant Street School; Henry Avenue Open Window School, Tuberculosis Dispensary of the Grand Rapids Antituberculosis Society; Sigsbee School, Mrs. Josephine A. Goss, Teacher, Tuberculosis Dispensary of the Grand Rapids Antituberculosis Society; Tuberculosis Sanatorium, Mrs. Sadie Gilbert, Teacher, Ralph Apted, M. D.; Kalamazoo, 114 East Lovell St., C. B. Fulkeron, M. D.; Ypsilanti, State Normal College Training School Department, Dimon H. Roberts, Supt.

Minnesota: Minneapolis, George Bancroft Open-Air School, Chas. H. Keene, M. D.; New School, Chas. H. Keene, M. D.

Missouri: Kansas City, E. W. Schauffler, M. D., Argyle Bldg.; Mt. Vernon, Missouri State Sanatorium, Miss Leolynn Sneed, Teacher, C. C. English, M. D.; St. Louis.

New Jersey: Camden, Bergen School, Miss Lida Ritchie, Teacher, Miss E. Cassidy, Principal, Henry H. Davis, M. D.; Montclair, Pavilion School, Miriam Bitting Kennedy, M. D., 138 Cooper Ave., Upper Montclair, N. J.; Newark, Prospect School, Miss Viena Y. Combs, Teacher, Geo. J. Holmes, M. D.; Open Window Camden St. School, Geo. J. Holmes, M. D.; Open Window Montgomery School, Geo. J. Holmes, M. D.; Open-Window Morton Street School, Geo. J. Holmes, M. D.; Orange, Anti-Tuberculosis Fresh-Air School, 124 Essex St., Margaret J. Orr, Nurse; Open-Air School, 283 Central Avenue, Katherine Porter, M. D.; Plainfield, Muhlenberg Place, F. J. Hughes, M. D.

New York: Auburn, Miss Louise Montgomery, Teacher; Albany, Geraldine Mullin, Teacher, Chas. K. Winne, M. D.; Buffalo, School No. 18, Franklin W. Barrows, M. D., 1864 Michigan Ave.; School No. 23, C. E. Beach, Teacher, Franklin W. Barrows, M. D.; South Side Fresh Air School, Mr. Smallenburg, Teacher; School No. 38, G. E. Hauley, Teacher; School No. 34, Anna M. Donavon, Teacher; Park School, Jewitt Avenue; Maur School; New York City, 17 Open-Air Classes in Public Schools, I. Ogden Woodruff, M. D.; Bellevue Hospital, Ferryboat Children's Clinic, I. Ogden Woodruff, M. D.; Day Camp Westfield; Day Camp Middletown, B. K. Waters, M. D.; Day Camp Rutherford, Richard M. Mills, M. D.; Vanderbilt Clinic Day Camp, F. Morris Class, M. D.; Gouveneur Hospital Day Camp; Ethical Culture School; Horace Mann School, Henry C. Pearson, Principal, H. B. Keyes, M. D.; Home Hospital, E. C. Brenner, M. D.; Brooklyn, 9 Public Schools; Brooklyn Heights Seminary, I. M. Van Cott, M. D.; Open-Air Class Friends School, L. C. Ager, M. D.; Long Island College Hospital, J. C. Rushmore, M. D.; Rochester, Scio Street Open-Air School No. 1, Geo. W. Goler, M. D.; Iola Sanatorium Open-Air School No. 2, Montgomery E. Leary, M. D.; Saranac Lake, D. C. Twitchell, M. D.; Schenectady, Washington Irving Grammar School, R. D. Zimmer, Teacher, 15 Chestnut St.; Willett and Maplewood Sts.; Syracuse, Clinton School, Ella H. Cook, Principal, Harry Myron, M. D.; Utica Open-Air School, Utica Free Dispensary; Utica Open-Air Class, Utica Free Dispensary; Watertown.

Ohio: Cincinnati, Little Red School House, Municipal Tuberculosis Sanatorium, C. S. Rockhill, M. D. and Wm. Peters, M. D.; 1st Intermediate School, Wm. Peters, M. D.; Guilford School; Cleveland, Tent Colony Buckeye Road, John H. Lowman, M. D.; 5 Public Schools; Columbus, C. O. Probst, M. D.; Toledo, Cherry Open-Air School, C. G. Souder, M. D.; Navarre Open-Air School.

Pennsylvania: Bryn Mawr, Phebe Ann Thorne Model School, Matilde Castro, Principal; Hazelton, W. C. Galey, M. D.; Harrisburg, 2 schools; Mount Airy; Philadelphia, 4 schools (Binny, Bache, Jackson and Muhlenburg), Walter S. Cornell, M. D. and Walter W. Roach, M. D.; Singerly School, Walter M. Roach, M. D.; Pittsburgh, Irene Kauffmann Settlement House, H. B. Burns, M. D.; Tuberculosis League Hospital, Mrs. Carmak, Teacher, Wm. Chas. White, M. D.; Protestant Orphanage Open-Air School, Mrs. J. M. Robson, Teacher, Wm. Chas. White, M. D.; Williamsport, 2 schools, W. F. Kunkle, M. D.

Rhode Island: Pawtucket, Summit Street, James L. Wheaton, M. D.; Providence, 216 Hope Street, Miss Mary C. Wheeler, Teacher; Public Street School, Robert C. Robinson, M. D.; Public School, Meeting Street, Ellen A. Stone, M. D.

Virginia: Norfolk, Berkeley School (Colored), L. T. Royster, M. D.

Washington: Bellingham, State Normal School; Seattle, Lovell School and 9 others, Paul West, M. D.; Tacoma, New Central School, E. A. Montague, M. D. and B. E. Drake, M. D.

Wisconsin: Green Bay, A. O. Olmsted, M. D.; Kenosha, G. Windesheim, M. D.; Madison Open-Air School, Arthur G. Sullivan, M. D.; Milwaukee, Prairie School, Geo. P. Barth, M. D.

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OPEN-AIR PAVILIONS FOR HOUSING TUBERCULOUS CHILDREN.

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of Tuberculosis.

The importance of the problem of tuberculosis in childhood is now recognized, and the great need of providing hospital and sanatorium treatment for children suffering from pulmonary tuberculosis is accepted as an essential part of the campaign against this disease.

The practice is well established of treating on open-air porches children suffering from tuberculosis, pneumonia, measles, and other acute and chronic diseases, and children who have contracted these diseases usually improve when placed in the open air. Recent investigations have shown that in a given number of children dying from various causes, a much larger percentage of deaths is due to tuberculosis than was supposed to occur from the disease. Taking this knowledge into consideration with the fact that it is only a short time since there were practically no beds provided in the hospitals and sanatoria of the United States for children suffering from the pulmonary form of this disease, it is hardly necessary to point out that there is a great need for such accommodations.

During the year 1912 the demand became so insistent in certain sections of the country for beds to be set aside for this purpose that it has brought about within the last few months the construction of a few children's pavilions at some of the larger institutions.

The buildings described in this article belong to the true open-air type of pavilion or ward building and are a part of institutions having service and administrative facilities housed in other structures. These pavilions can also be adapted to the use of large institutions for healthy children, such as orphan asylums and industrial schools, for there is no reason why healthy children should not sleep in the open air. One of the structures described here was designed for this purpose by Dr. Hastings H. Hart of the Russell Sage Foundation, who advises that these institutions provide arrangements for the outdoor sleeping of 33 per cent. of their inmates. It is said that at least one-half of the children sent to reformatories and orphan asylums are physically defective, probably because of bad heredity or through poor feeding and unfavorable environment. Too often these children are taken from insanitary homes only to be put into poorly ventilated dormitories. These dormitories are in many instances on one side of a building where cross ventilation

cannot be secured, and often window ventilation is not thoroughly used because the beds cover so much of the floor space that an open window produces a direct draft on the heads of the children.

While there is not a great deal of difference between the open-air buildings for housing children and open-air buildings for housing adults, certain facts regarding children should be kept constantly in mind when designing pavilions for them. Children are much more susceptible to contagious diseases than adults, and should, therefore, be housed in such a way as to prevent the spread of these diseases among a large number of individuals. In some institutions there are special receiving wards where the children remain without coming in contact with the regular inmates of the hospital from the time they first enter until the incubation periods of the acute contagious diseases are past.

In working out the plans of pavilions for housing tuberculous children it is well to consider the following suggestions:—

1. That babies should be kept separate from the older children.
2. That boys should be placed in wards that are distinctly separate from the wards for girls.
3. That adequate provision should be made for the detention, observation, and isolation of the children when they first arrive at the institution.
4. That adequate provision should be made for the isolation and care of children showing symptoms of acute disease during the course of their treatment for tuberculosis.
5. That adequate porch space should be provided for the fresh air treatment.
6. That special doors and reception rooms should be provided for the admittance of visitors so that they cannot mingle with the patients without permission.
7. That an out-patient department should be kept as far away as possible from a pavilion for children.
8. That a suitable laboratory for the examination of milk should be provided wherever children are housed in large numbers.
9. That a large tank under automatic control should be provided for the mixing of hot and cold water used in the lavatories.

The pavilions described and illustrated here have one or more unusual and interesting features; many of these are new ideas used for the first time in buildings designed for the open-air treatment of disease and should be studied with a view to incorporating them into the plans of new pavilions.

At the Willard Parker Hospital in New York City there has just been completed a building for the housing and treatment of children suffering from measles. This structure, shown in Fig. 1, is described among buildings for housing tuberculosis patients because it was erected for the purpose of treating children's diseases in open-air wards, and the plans follow closely a type of pavilion con-



Fig. 1.—The New Pavilion at the Willard Parker Hospital, New York City, for the treatment by the open-air method of children suffering from measles. William E. Austin, Architect.



Fig. 2.—The new Children's Ward at the John Sealy Hospital, Galveston, Texas, for the treatment of surgical tuberculosis by the open-air method. Henry T. Phelps, Architect.



Fig. 3.—A two-story Pavilion at the Hospital School for Crippled Children, Canton, Mass., with a separate Monitor roof for ventilating purposes on each story. Designed by Dr. John E. Fish.



Fig. 5.—The Girl's Pavilion for treating children with pulmonary tuberculosis by the open-air method at the State Sanatorium, Westfield, Mass. E. C. and G. C. Gardner, Architects.

structed at the Riverside Hospital for housing tuberculosis patients. The building is constructed of reinforced concrete, seven stories high, and was designed to obtain the largest amount of fresh air and sunlight in the wards and rooms that is possible with adequate weather protection.

The building, including the porches, is 206 ft. long by 55 ft. deep. The central section throughout all the stories is used for administrative and service purposes, and the wings for housing the patients. On the first floor a corridor divides the building through its entire length and in the two wings opening off this hall are twenty-two observation rooms. Large portions of the partition walls between the rooms are made of glass in order that the nurse may overlook all the rooms from any one in a row. Each one of these rooms is an isolation unit in itself, as it contains an individual lavatory and toilet and can be entered from the porches.

Two other interesting features on this floor are the apartments arranged for the admission and discharge of the children. The new patients enter through a door in the rear of the building at the far end of the right wing, and, in order to reduce to a minimum the chance of carrying infected material into the hospital, are passed through three rooms during the course of disrobing, bathing, and redressing. The apartment through which the patient leaves the building is arranged in the same manner at the extreme end of the opposite wing.

Above the first story on all the floors each wing is divided into two wards by a partition running parallel with the front and rear walls of the building. The wards face east and west, and the upper part of the partition is made of glass and sash which when open provides cross ventilation through the entire wing. Each ward has a capacity of twelve beds and is divided by glass partitions about 7 ft. high into six alcoves in order to separate the beds from each other to a certain extent. Opening on to the wards at the end of the building are sun rooms or porches connected on all the stories by fire escapes.

The most interesting feature of this structure to those planning a building for housing tuberculosis patients is the dividing up of a floor space, equal in area to an old-fashioned ward for twenty-four patients, into small units of two beds each. This illustrates a method of meeting the steadily growing feeling that it is not right to house patients with advanced tuberculous disease in close proximity to each other in large wards.

In Galveston, Texas, there has lately been added to the John Sealy Hospital, a new ward for children. This is a detached building erected for the care and treatment, by the open-air method, of children suffering from surgical tuberculosis. The building (Fig. 2) is two stories high, designed on the lines of the picturesque and

pleasing Mission style of architecture with low-pitched roof and deeply recessed porches. The roof is of the hipped variety covered with asbestos shingles and, although it has a very moderate pitch, is high enough above the ceiling of the second story to provide for an ample air space between the roof and the ceiling so necessary to comfort in warm climates.

The building is fireproof throughout, of monolithic reinforced concrete construction, with concrete floors finished on the top with wood or composition, and the interior walls of concrete covered with plaster worked to a smooth finish. From the front entrance running directly through the building is a wide hall. This is open at the rear end and forms a loggia which provides an open-air working apartment for the attendants.

On the first floor in the front of the building, to the right of the hall, is a ward opening on to a screened sleeping loggia. In the rear of the ward is a locker room, toilet, and bath. To the left of the hall at the front is a reception room; behind this a dining-room; and still further in the rear a pantry and kitchen.

On the second floor to the right of the hall the arrangement of the ward, loggia, locker room, and toilet is the same as on the first floor, while on the left of the hall are four private rooms. At the extreme end of the building, cutting off a portion of the hall, is a loggia for private patients.

This structure is interesting in that it illustrates how well the Mexican or Californian Mission style of architecture with its deep open loggias can be copied in designing buildings with open-air sleeping apartments.

The boy's cottage at the Massachusetts Hospital School, shown in Fig. 3, is a two-story frame building having an independent Monitor roof for each story. A Monitor roof, as this type of roof has been named in Massachusetts, is a roof laid at a rather low pitch with a break in the slope of both sides near the ridge in which are placed rows of windows. These windows are about 2 ft. high and can be opened and closed by fixtures arranged for the purpose on the walls of the wards. When this type of roof is used in connection with a large window space in the side walls of a building, it affords an excellent way of obtaining cross ventilation. A test was recently made at the school in order to show the greater efficiency for ventilating purposes of the Monitor roof over indirect ventilation in an ordinary room. This was done by filling a room of each type with smoke and then noting the time necessary for clearing the atmosphere. By ordinary window ventilation from one side of the room only, it took thirty minutes to remove the smoke completely, while by cross ventilation through the Monitor roof the room was completely cleared in thirty-five seconds. Wards constructed with this type of roof are so well ventilated that in planning new buildings it has not been thought necessary to consider

the cubic air space for each occupant as required in other buildings. Where ground space has not been sufficient for a number of one-story pavilions, two or more have been constructed, one above the other. In such instances the ventilation of the lower story has proved thoroughly efficient.

The cottage for children's institutions, shown in Fig. 4, was planned in order to provide open-air sleeping quarters for a part of the inmates of institutions such as orphanages and reformatories. The architect in designing the building specified the use of hollow tile construction for the walls with reinforced concrete floors, and tile laid on wooden joists covered by boards for the roof; these materials to be used for the sleeping porches as well as in the central section. The roof, doors, windows, and the casings are the only parts of the structure which are inflammable.

The building is two stories high, 80 ft. across the front, and 40 ft. deep through the centre. The wings contain the open-air sleep-



Fig. 4.—A Cottage with open-air sleeping quarters for children's institutions. Designed by Dr. Hastings H. Hart.

ing porches, and these are arranged in two stories in order to place all the children in the building under the supervision of one nurse or attendant in the central front room on the second floor. In order to allow a person to overlook all four of the porches from one room, two small windows, one above the other, have been placed in the side walls of the central room and its floor constructed on a different level from the floors of the second-story porches.

On the ground floor in the front of the building, connected by stairways leading to the sleeping porches, are two dressing rooms, each equipped with lockers, baths, and lavatories for ten children. A toilet for use at night is placed at one corner of each sleeping porch and within the walls of the central building in order to prevent the plumbing from freezing. The cottage is an independent unit so far as service facilities are concerned, for on the first floor at the rear of the building in the extension is a kitchen, a pantry, and a dining-room. Above these rooms on the second floor is a

school-room which is lighted and ventilated by windows on three sides and can be overlooked from the nurse's room.

This building is of interest because of the arrangement for supervising four sleeping porches from one room, and if this feature were incorporated in the plans of pavilions for housing children suffering from tuberculosis, it would probably make the work of nursing the patients lighter. The building accommodates twenty children and by increasing the size of the wards, the capacity of the building could be doubled at a very slight addition to the cost of construction.

Previous to 1910 there were no beds available in Massachusetts for children under fourteen years of age suffering from pulmonary tuberculosis. In that year the sanatoria at North Reading, Lakeville, and Westfield were opened and a few children admitted. It was found later that it was easier to treat a number of children together at one hospital than it was to care for a few at each institution. For that reason the children at the three institutions were all gathered at Westfield and the girls' pavilion, shown in Fig. 5, was provided for the purpose of housing them. This building is of frame construction, 110 ft. long, with the roof and exterior walls shingled and the interior walls left unfinished. Among the interesting features of the structure are the skylights let into the front slope of the roof. These are laid of $\frac{1}{4}$ in. wire glass in sections about 5 ft. square.

The central section of the building contains a sitting-room on the front, and a locker and dressing-room on the rear. This room, besides having ample space for individual lockers, is equipped with six lavatories, three toilets, two showers, and a bathtub. The two wings each contain a ward flanked on both sides by covered porches. The roofs of these porches are not a part of the main roof of the building, but have a very slight pitch, and at the outer edge are only 7 ft. above the floor. As the wards are open on both sides, this arrangement of the roofs of the porches is a part of the plan for weather protection, which further consists of frame shutters covered with canvas. The frames are hung from their upper edges on hinges, and when open are held flat against the timbers of the porch roof. These wards, with their skylights, low-roofed porches, and frame canvas shutters, are unusual. An open-air school is carried on in the end of one ward. This space has proved to be a well-protected and lighted school-room. Every morning in arranging the ward for school purposes the beds are pushed to one end and the bedside tables are placed in rows and used for desks. At the present time there is a new children's pavilion under construction at this institution. It is a much larger building and, while the plans embody all the good features of the girls' pavilion, there are a number of improvements in them. It was impossible to obtain a photograph to illustrate the building, as it is still in the early stages of construction.

FRESH-AIR CLASSES IN THE PREVENTION OF TUBERCULOSIS.

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The fresh-air propaganda of the Antituberculosis societies has had wider results than these organizations ever hoped for. Not only do we give the patient suffering from tuberculosis the greatest possible amount of outdoor fresh air, but we also give the same advantages to the children of the tuberculous, his neighbor's children, and even to the anemic, ill-nourished, under-weight and nervous child. In fact we have learned practically that "an ounce of prevention is worth a pound of cure" in the tuberculous as well as in other patients, and are doing all we can to fortify the possible subject of tuberculosis against the advent of the germs. To put it in still another way, having learned from autopsies that most people at some time in their lives suffer from tuberculosis, we are preparing the system of the child to resist the attacks of the enemy by giving him all the fresh air possible, making his blood as rich as possible, increasing the number of the red cells and hemoglobin, and giving him extra food supplies to increase his nutrition.

One of the agencies for this good work is the fresh-air class in the public school system. This method of work has been taken up by the most advanced systems of public education, notably by New York, Newark, Boston, and Rochester in the East, and by Chicago and other western cities.

The greatest danger of tuberculosis for the school-child lies not in the school itself, but in contact with parents and friends suffering from the disease. The tubercle bacillus is not at the present day so omnipresent in the school-room as perhaps it once was. Open cases of tuberculosis that are ejecting bacilli with their cough are to-day removed from the school-room, and are either placed in fresh-air pavilions with others suffering from the same disease, or are sent to sanatoria where they may be systematically treated. The cases seen in the public schools to-day are those of closed glandular tuberculosis, especially those having enlarged cervical glands, due to diseased tonsils, and of tuberculosis of joints, generally in the stage of improvement or recovery, and not liable to leave any germs in the school-room. These joint cases need building up in order to get permanent healing, and are suitable for the

fresh-air class because not ejecting any bacilli. They thus gain the advantages of school at the same time that they have those of the open air. The length of treatment is shortened as well as the time of absence from school advantages.

Open cases of tuberculosis should not be treated in a fresh-air class with well children. The fresh-air class for anemic children stands in the same relation to the sanatorium as does the preventorium. The pre-tuberculous state includes all such conditions as lower the general health and lessen resistance to disease. Here belong anemia, malnutrition, whether from disease, poverty, or lack of fresh air at night, imperfect recovery from infectious and other diseases, those children who are subject to colds and bronchitis, and nervous children. Another child who can be greatly benefited by the fresh-air class is the one who suffers from chronic indigestion, loss of appetite, and constipation. Here his 'bilious attacks' and headaches will cease. The 'fidgets' of the nervous child will lessen, and the child backward for physical reasons is able to attend better to his school work. In addition to the fresh air and extra nutrition he will receive special attention in his work and help to understand it, such as cannot be given to a member of the ordinary class of fifty children assembled in one room. The smaller number of children in the fresh-air class gives this opportunity for special instruction. Consequently, the backward child will get along faster than in an ordinary graded class, will make his grades and be promoted where he might have failed, and when his health is reestablished will be able to return to an advanced grade.

For the benefit of those readers who are not familiar with the City of Greater New York, it may be explained that Greater New York consists of five Boroughs—Manhattan, Brooklyn, Bronx, Richmond, and Queens. Manhattan and Brooklyn are densely settled, and contain many manufactories and tenement houses. Bronx also in parts is closely settled with high flat buildings, in other parts being a typical suburban community. Queens covers 125 sq. miles, and is a land of homes and detached houses, with very few tenements, although there are factory neighborhoods. Richmond is an island in New York Bay and is essentially suburban. There are in all the Boroughs at present 23 fresh-air classes, the system having been begun three years ago, and about half the classes introduced last year. The report of Dr. I. Ogden Woodruff, for 1913, states that there would be many more of these classes but for the overcrowding which makes the use of the necessary rooms for the smaller number of children impossible. He believes that the result of the work of the three years has amply shown the value of the fresh-air class system, and the advisability of extending it in all the Boroughs.

The classes are divided as follow: 14 in Manhattan and the

Bronx; 8 in Brooklyn and Queens; and 1 in Richmond, the sea-shore Borough, where is located the large new sanatorium for tuberculosis of Greater New York.

It is not the intention of the writer to speak here of the open-air pavilion type of class, such as is devoted to the treatment of children already openly tuberculous, but of the open-window type that is generally used for the pre-tuberculous state. In New York the tuberculous children have been accommodated on an old ferry boat moored at the dock used by the Department of Charities. A fresh-air class of the open-window type may be organized in any ordinary school-room and in any school, by making certain changes in the arrangements of the room. The ordinary window-sashes are removed and replaced by sashes swinging on pivots, like the ordinary church window, four sashes being placed in each window, and the entering air directed toward the ceiling. The ordinary school desks are removed and replaced by desks and seats fixed on small platforms, each chair revolving on a pivot, and each desk being adjustable to the height of the pupil. Thus each seat with its desk can be moved about the room at will, which allows of making places for the reclining chairs. The reclining chairs, of canvas stretched on wooden frames, are an addition to the ordinary equipment of the room. There is a gas stove for heating milk placed in an adjoining room. A standard scale is placed in the class-room to facilitate the weekly weighing of each child.

This class is an ungraded class, and is limited in number to twenty-five children. Hence there is extra floor space which can be used for extra physical training, and for placing the chairs for the rest period. The time of the class is so divided that the ordinary studies of each child's grade are taken up, but are interspersed with an unusual amount of physical exercise, including singing, and with extra rest. Blackboard work is frequent, and the children are allowed to leave their seats more frequently than in a graded class. At 10:30 a. m. a luncheon is served consisting of hot milk and crackers or simple cakes. It is found that children who spend the entire day in the open air need to have their 'furnaces stoked' more frequently than those sitting in closed window rooms. They feel the cold less when their stomachs are working and making new heat for the body. After luncheon they are better able to go on with their work. When the child returns from his warm home dinner at one o'clock he at once dons his sleeping bag over his ordinary out-of-door clothing, and rests for an hour in his reclining chair. Most of the children really sleep through the greater part of the hour from one to two, and those who do not are not allowed to talk or walk about. They resume their studies at two o'clock and another lunch of crackers and milk is served a half hour later. Each child takes one pint of milk daily in this way.

One advantage of this form of class is that a child who is back-

ward for physical reasons, and who has previously been unable to keep up with his fellows, is no longer subjected to injurious competition. This is his own 'special class,' and he is just as good as any other scholar in it. The afternoon rest aids the nervous child in conserving his nerve energy and prevents the afternoon fatigue from becoming too great.

Another advantage of the fresh-air class is that the smallness of the numbers permits of a relaxation of discipline. The children work in groups at the blackboard, and often assist one another in understanding problems of arithmetic, the higher grade pupil assisting the lower one in a most helpful way. A spirit of helpfulness and altruism is developed in the class which will be of value in the future. The children aid in placing the reclining chairs for the rest period, and in serving the lunches. In the ungraded fresh-air class, with which the author is most familiar, it has been found



Fig. 1.—Rest period.

that when a child becomes vigorous enough to return to a grade he is not at a disadvantage, but is able to do as well as the other pupils. Of the class in Public School No. 90 the members at present enrolled will all get their regular promotion at the February promotion period. Thus they have not lost any time by entering this class. The teacher states that her work is very much like that of the ordinary country district school, where all grades are taught in the same room.

The sleeping-bags provided by the New York Board of Education are made of very heavy blanket material. They are bound with enamel-cloth to strengthen the edges, and the lower two feet are made into a closed bag to protect the feet, over which is an additional canvas bag for added warmth. Many of the children wear felt shoes. It is found that with the ordinary out-of-door clothing the cold is felt only in the hands and feet. The top of the sleeping-

bag comes to a point, and is so arranged with closing clasps that it may be folded into a pointed hood. During the rest hour no talking is allowed and the children must lie still in their chairs.

On cold days it is impossible to do all of the ordinary school work. The ink becomes congealed and writing with a pen is impossible. The studies are then varied to suit the weather, and added physical exercise is interspersed. The children wear mittens, and the teacher tells the writer that by wearing gloves and keeping her hands warm with a muff she is perfectly comfortable, although she wears no hat. Most of the children wear worsted caps or hoods.

It is important to have the children who are about to enter a fresh-air class submitted to a thorough physical examination by a



Fig. 2.—Fresh-air class of public school No. 90, Queens. In order to get the proper light for the camera it became necessary to close the windows in the rear of the class and pull the shades. The side of the room to the right of the picture has four large windows with sashes on pivots, into which the southern sun streams all day. They do not appear in the picture. The movable platforms are well shown.

physician, to induce the parents to have removed all the defects found, such as enlarged tonsils and adenoids, and to have treatment of any conditions causing defects of hearing or eyesight. The teeth should be carefully inspected, all cavities filled, and decayed stumps of first teeth removed, so as to get a healthy mouth to second the effects of good air and food.

The fresh-air class in which the writer has been especially interested was established in Public School No. 90, Queens Borough, March, 1913. As it has been in operation only eight school months results are not so great as they will be later. The school is situated in Richmond Hill, a region of detached houses, and of better living conditions than are general among public school-children of Greater New York. At the time of its beginning, when the examination of candidates was going on, there was considerable question in the

minds of parents as to whether they favored placing their children in the class. The writer was obliged to assure them that no sick children would be placed in the class, but that all tubercular cases would be treated elsewhere. This knowledge removed the fear that the children would be subject to possible tubercular infection from others in the class. At present we have several children in the class whose parents have asked to have them placed there, and there is a waiting list. One of the older girls, who has a presystolic heart murmur, was ordered by her physician to have fresh-air treatment, and her parents not only moved to a suburban district, but settled within reach of the only fresh-air class in that part of the Borough. Her appearance and health have much improved in the four months during which she has been a member of the class, and one would never suspect her of cardiac disease. One girl of nine had always suffered from headache and bilious attacks while attending the ordinary closed window class. She has now recovered from these symptoms and is the picture of health.

Of the cases of special interest in this class, one is a boy of seven years who had a mass of tubercular glands removed from the right side of the neck one year before entering the class. He has still some enlarged glands in the left side of the neck. He is at present the picture of health, and is steadily gaining in weight. Another girl of eight years had a left mastoid operation done at nine months of age, and at the time of entrance into the fresh-air class had still a discharging sinus behind the ear. Her hearing is impaired on that side, and there is an old left facial paralysis that has not recovered. We are told that these chronic ear troubles are often tubercular. Her adenoids and enlarged tonsils were removed during the last summer vacation. Although her weight has fluctuated considerably, it has in the main increased, and at the end of eight months in the class she weighs $3\frac{1}{4}$ lb. more than when she entered it. The sinus is closed. Her general appearance has much improved, but it would appear that her health is not as yet firmly re-established. Her mother died of tuberculosis, her father of 'a complication of diseases.' She has enlarged cervical glands. It will be most interesting to watch the progress of this case. Of the other members of this class 4 had adenoids and enlarged tonsils, 1 had defective breathing, 1 enlarged tonsils alone, and 1 defective hearing. One has had adenoids and tonsils removed since he entered the class. Ten were noted as having defective teeth. The remainder were admitted on account of their evident anemia or lack of nutrition. There is now a general appearance of health, ruddy cheeks, and superabundant energy. It is noticeable that the children have fewer colds than when in a graded class.

There has been a general increase in weight, improvement in general health, improvement in color, increased appetite, and greater ability to do class work. While the weights increased immediately after entrance into the class in March, as the weather grew warmer there was a slight decrease. Most of the children

maintained their weight during summer, and a fresh increase began as soon as the class routine was again established. This increase was remarkable as the cold weather came on, and was not all due to added clothing, showing that fresh air and cold weather do not drain the system of the weak child in a fresh-air class but on the contrary are the cause of increase in weight and health. One girl has been returned to an advanced grade on account of her improvement in health.

Dr. Woodruff, of the Department of Education, has made a careful and interesting study of the amount of benefit received by the children in 11 of the fresh-air classes under the New York School system, covering a period of 156 school days. It includes in all 232 children. They were divided into two groups, one of which, including 103 children, had extra feeding while in the class; the other, including 129 children, had no extra feeding. Another class of 24 normal children in an ordinary class-room were studied as controls. The added food consisted of crackers and milk, so arranged that each child should receive 350 calories a day. The weekly weights were carefully recorded, and hemoglobin estimated at the beginning and end of the experiment. The pupils were selected for their evident malnutrition and anemic appearance.

Dr. Woodruff's results are tabulated and make interesting reading. They are contained in the Fifteenth Annual Report of the City Superintendent of Schools, 1912-1913, published by the Department of Education of the City of New York. He found that the average gain in weight for the feeding class was 4.4 lb., and for the unfeeding class 3.6 lb.; the gain in hemoglobin for the feeding class was 4.0 per cent., for the unfeeding 3.7 per cent.; for the controls, gain in weight, 4.7 lb., hemoglobin, 3.8 per cent. In spite of the lesser gain in weight of the non-feeding classes, the gain was still such as to be sufficient to keep up the standard of nutrition which they had on admission. He says: "These results are very interesting. In the non-feeding group we have children coming mostly from poor homes, undernourished, placed out-of-doors without any additional nourishment, and yet who gained enough to maintain their nutrition despite their handicaps. . . . It shows in each case a striking gain of hemoglobin in the very anemic, somewhat greater in the non-feeding class, and unexpected loss in those having over 80 per cent., which is greatest in those children whose hemoglobin was highest on admission. . . . The control class shows that the losses of the children with over 80 per cent. of hemoglobin were really much greater in the indoor class; and that between 70 and 75 per cent. there is also a loss as opposed to the gain in the fresh-air class." This interesting experiment would seem to show that children in the ordinary indoor class lose in blood-content during the winter session; and if this is so there is every reason to wish to prevent this anemia by multiplying fresh-air classes, or at least by applying some of their benefits to the conduct of the indoor classes. The writer would submit the idea that the lowering of

the often intense heat of the large artificially ventilated school building, where the ventilation system is put out of gear by the opening of the windows, and at least partial substitution of natural ventilation by the windows with guards so arranged that the cool air shall not directly strike the heads of the children, would assist in lessening this loss of hemoglobin.

The work of fresh-air classes in Manhattan has shown, that poorly nourished and anemic children from poor homes may be placed in a fresh-air class and kept there during the winter without physical injury and with actual benefit to themselves as shown by a marked increase in hemoglobin and improvement in the general health. As Dr. Woodruff has said, and as the author can corroborate from personal experience, when you see a girl who was listless, did poor work, and was liable to faint in the class, develop energy and ability, and cease to faint in a month after entering the fresh-air class, and do her work well throughout the year, the value of the system becomes evident in other ways than by simple increase in weight and hemoglobin. When children who had headaches, 'bilious attacks,' and lack of appetite become hearty eaters, and get over their headaches and vomiting, the need of open-window treatment of all our classes is suggested.

The writer has been observing school-children for fifteen years as Medical School Inspector under the Health Department of New York City. The work of medical school inspection was by law placed in the hands of the Department of Health when inspection was instituted. She has seen many a child falter and fail in the intense heat maintained by ignorant janitors in steam-heated schools. She has seen children get the 'fidgets' and hot, red cheeks in the afternoon of a warm day, when even with all windows open and the steam turned off the temperature of the crowded room was 75° F. She would make a plea for intelligent janitors, and intelligent supervision of the heating and ventilating of all large school buildings, and the application of fresh air principles to this most practical problem.

As to the prevention of child tuberculosis, the fresh-air class has solved the question of how a pre-tuberculous child may profitably enjoy the benefits of an education without losing the benefits of the out-of-door air, and gaining a tubercular lesion of the lungs. The out-of-door games at recess and the out-of-door dancing of the regular classes in the New York City schools are assisting in giving the regular classes their quota of fresh air. May the time soon come when these shall not be classed among the 'fads and fancies' that the layman regrets having added to the 'three Rs' for his children. And may the time soon come when the teacher also is obliged to take her noon hour outside the school building, avoiding the temptation to get away from school earlier by getting her report work done at noon. Should this be done, we should save in the amount of salaries paid to teachers away from duty for nervous breakdowns.

PRACTICAL EDUCATION FOR SUPPRESSING TUBERCULOSIS.

By HAROLD B. WOOD, M. D., D. P. H., of Providence, R. I.

The elimination of any disease is dependent upon the completeness of controlling existing cases and the practicability of efficient means for preventing the development of future cases. A suggested preventive measure may be effective but not practical, so public education in regard to useful and efficient methods for preventing or suppressing tuberculosis may be of little benefit unless given in terms which are understood and for methods which are helpful.

Before beginning to fight diseases in any community certain knowledge is essential. The prevalence, the effect, the source, the locations and the various industrial and social conditions concerned in producing or promoting this particular disease should first be noted, so that no time, money or energy be misdirected. With tuberculosis these points are especially necessary. To them must be added the effective methods to control, to combat, and to educate. A tuberculosis survey of sufficient magnitude should be made that practical and rapid advance may be accomplished. The prevalence and location of those dusty trades which are most apt to lead toward tuberculosis, of crowded tenements, sweat-shops, public wash-rooms, cheap hotels, public towels, cups, cigar cutters and the host of other influences which effect the occurrence of the disease, should be determined. The nationality and temperament of the employers, employees, parents and children to be lectured or exhibited to must be learned. Exhibits, moving pictures, public displays or lectures—whatever method is employed for educating the masses in public health—all must keep abreast of the times, using the modern schemes of advertising or amusement, so that the attention most desired is immediately drawn.

Probably the most significant result of the general health educational movement has been to create an intelligent public sentiment and enlightened public opinion which now demand and support projects for the public health. This co-operation of the public is essential, for with it developments are certain to be progressive. The public has become restless for that knowledge which will produce health and comfort. But the public is selective in its way of accepting instruction. The public lecture, although the primary development in public health education, is of decreasing relative value. The public wants excitement; sedate lectures are no longer

satisfying. So other methods of attracting the public must be adopted.

The public which is to be reached in a tuberculosis campaign should realize that the efforts being made to eliminate this disease are producing tangible results. In Massachusetts the tuberculosis death-rate is now just one-half what it was twenty years ago, and one-third what it was forty years ago. This difference, and the fact that the rate of decrease is now twice what it was thirteen years ago, means that each year the disease is disappearing with increasing rapidity and is under control and being conquered.

There is a correlation between the activities adopted to prevent one disease and the resultant reduction of other diseases. It was by no accident that the installation of water filtration for reducing the typhoid in Lawrence, Mass. materially decreased the tuberculosis.

Polluted water, polluted food and polluted air contain more than the specific germs of certain diseases; they contain those substances which are devitalizing and destructive to physical resistance. As a consequence, efforts to overcome these insanitary conditions affect not alone tuberculosis and typhoid, but the morbidity rates of various diseases as well as the general mortality rate. This idea the public should grasp. Teaching specific antituberculosis measures to school-children is merely teaching hygiene, for any habits the children are taught, as a method of preventing their getting tuberculosis, will result in decreasing the transmission of the usual communicable school diseases and will decrease the child mortality.

The foundation of public instruction is publicity. The most important publicity is that obtained through the daily newspapers. Judiciously worded articles in the papers reach a greater number of people than can be approached by all other agencies combined. The cordial co-operation of the press is one of the most encouraging and assuring phases of the whole public health campaign. While many desirable articles in the press are written by public health authorities, the editorial staffs frequently set the initiative in writing most helpful articles upon various health topics. It is usually easy to differentiate the authors: the editor writes in newspaper style, and that is the proper phraseology for newspaper articles. Unfortunately the majority of newspaper notices emanating from health offices have a medical journal twang, too scientific, too uninteresting, too colorless, without the necessary clear cut, convincing popular language which needs no further explanation and admits of no argument. Three short articles are far better than one long one. A distribution on different pages of short notices upon different health subjects is certain to catch the eye of most readers. If a sudden onrushing educational campaign is to be performed, the subject in hand, tuberculosis, must

be brought to public notice at every legitimate turn. A few lines of thought or the depicting of some past or future action of public health work, distributed over the newspapers, in the news columns and in the social, personal, editorial and rural columns would have marked effect. This was the method of Routzahn with the National Tuberculosis Exhibit, and was a force which made the success of that undertaking, and was a great factor in making the tuberculosis campaign a nation-wide movement.

The authorization of newspaper notices is an important as well as a vexing question. Some notices are most effective—and effect is the end of the means—when recorded as a conversation; many notices are more effective with no names or no authority mentioned. Some few notices, however, when emanating from a health office have little effect unless their origin is apparent. The better thinking public would perhaps prefer to have signatures to all newspaper articles of value. For a practising physician, serving as health officer, to sign his newspaper notices would beget jealousies and suspicions of breaches of professional ethics. Some lay people might suspect that the signature, or the entire article, was intended as an advertisement. Therefore it is unwise for a medical practitioner to sign his name to public health notices. The lack of name or signature to important articles leads the public to guess perhaps wrongly the author. This difficult question is solved by the community employing a whole-time health officer, the great need of the country. The editors properly reserve the right to permit or to include the name of the author of every article printed.

Truthfulness is the surest measure of success. Exactitude in statements upon the platform or in print is the proper basis of a public health campaign. A departure from the truth or the reckless juggling of statistics or addition of a few cyphers can but markedly detract from the final effect. Exaggeration quickly wilts until the whole flowery effect is discarded by the public and the cause discredited.

The well-planned public exhibit is probably the most effective single method of educating the public upon matters of health. The exhibit should be attractive and locally applicable. No single exhibit without rearrangement of material can produce the greatest effect attainable for different localities. An exhibit showing specialties, as, for example, housing conditions and dusty trades, should display in prominent places those sections which are especially applicable in the particular community where the exhibit is shown. If some specific sections of the exhibit, as those dealing with playgrounds, with stone cutting, hospitals or dairies, are not of local concern, they should be relegated to some corner or other unimportant area. This arrangement permits the subjects which are locally important to be brought to the fore. An exhibit should

be cosmopolitan in composition, dealing with various branches of the specific subject which is treated, with both elementary and advanced displays.

In arranging an exhibit the disposition of the material to be shown should correspond to the habits of mankind. As people enter a room they do not begin to realize they are inside until they have gone far past the entrance; therefore, any important exhibit placed near the entrance will not be seen. The exits should be located so that they cannot be seen from a distance. When people see the exits they usually can see nothing else, and will miss the exhibits placed near the exit doorways. Sidewalk windows which belong to the exhibit hall are admirable for street attractions, but should be used for attraction and not for much educational purposes. A striking exhibit when used in a window may convince the outside public of the necessity of their seeing the exhibit inside.

That part of a wall which is usually seen is upon the level of the eyes. Therefore, in hanging the placards and illustrations of an exhibit, the most important ones should be hung about 5 ft. from the floor. The whole wall exhibit had best occupy a width of only three exhibit cards or approximately be a band of text and illustrations about 6 ft. wide. Sets of cards to show sequence should be direct and of few numbers to a set, as the public is apt to walk in either direction, and by going the wrong way will miss the effect. Contrasts count. Illustrations, in text or in picture, in pairs to show contrast have great effect. These contrast the good with the bad, the harmful with the beneficial, detrimental with the advantageous, the devitalizing with the upbuilding.

The use of frivolous, exaggerated or impossible pictures or text, or the adoption of impersonated, gigantized or misshapen animals in illustrations is a measure to be deplored. Such alterations of the truth or laws of nature can only detract from the seriousness and value of any exhibit or public health pamphlet. Some of the science faking has created a spirit of jest and has weakened the confidence and reliance of the public. The cartooning of bacteria is the most objectionable form. Some periodicals have followed up the jokes upon certain phases of medical work until their jesting has become vicious.

Pictures mean more than words, and well-made photographs, water colors, sketches or drawings convey more lasting impressions than mere texts. Pictures are perceived by those who cannot read, but, however, should be labeled by short descriptive phrases. They should not be confusing but distinct.

Text cards to be of much value in an exhibit had best be of short, trite phrases, definite, concrete, practical and applicable, readable and distinct. They should not be merely a jumbled up mass of words or misstatements.

Models are of great value in an exhibit. Although more difficult to construct, they are of more value than pictures.

The advisability of displaying in public exhibits pathological specimens of human tuberculosis is questionable. Bottled human anatomy is abhorred by many who resent the appearance of preserved diseased tissue. Many people are unable to note any difference between normal and tuberculous tissues, even with pulmonary cavity formation, while others admire the possession of the variegated colors from the infiltration of dusts or from hepatizations or pyogenic effects. Should resentment or disgust occur, as frequently happens, the person is apt to leave the exhibit without the impression it was meant to convey. Such a reputation damages the exhibit and also the whole work of public instruction in reference to tuberculosis. Owing to this spirit of horror and disgust being so frequently generated by the pathological specimens, it seems that a greater advantage would accrue if the physical and financial energy involved were devoted to other purposes. Unless a good demonstrator is constantly on hand, people will understand little of the pathological processes. On the other hand, there are children and women who will gape and laugh with a mixture of wonder and pleasure, having in them a wild morbid curiosity aroused. Such morbid temperaments should be debarred from pathological exhibits. If a public exhibit is to include pathological tissues, it is wiser to have these displayed in a separate room, at the door of which is detailed some one to determine who shall enter.

The display of normal and diseased animal tissues is an entirely different matter. Various diseased meats, with normal specimens for comparison, in their natural colors, make a valuable adjunct for teaching a needed lesson to butchers and buyers. In the absence of the specimens, correctly colored illustrations will serve.

Talks have convincing weight when made applicable to the conditions of the hearers. They should be given with enough enthusiasm to arouse attention, be phrased within the intellectual grasp of the audience, and be composed of those subjects which are of the greatest importance to the hearers. No written, set lecture can be delivered to many audiences of different ages, nationalities, intellects or occupations and be termed most successful. The needs of the people in the audience or of the community had best be learned, and the talk be woven around these. When impossible to determine the needs of the community or to make the talk strikingly applicable, the talk should be founded upon two themes, to the exclusion of all others: (1) How tuberculosis is spread and prevented; (2) its effects upon the body. Other subjects may be of interest, but the talks are not given for a diversion, but to instruct, and in a short talk much can be evolved from the various tangents which revolve around *Prevention*.

Several classes of individuals not reached by any other method of public instruction can be reached and influenced by short informal talks. Children, laborers, mechanics and employers, school classes, clubs, meetings and factory employees can be reached, interested and instructed, provided they are approached the right way and are told those things which will be of value to them. 'The basis of efficiency' is the only subject which will be received by some employers and civic organizations, but its theme can be the prevention of tuberculosis. Industrial efficiency and business results are the demands and only thoughts of many employers. Hence any efforts made to overcome insanitary conditions, as dust distributors which induce tuberculosis, have greater effect when made to reflect upon the company's ledger.

Finally, the individual talk in the home is the best method of teaching public health and the suppression of unnecessary disease and discomfort. This becomes the duty of the family physician, and will be demanded of him when his patients realize that it is better to prevent than to cure.

Too frequently, physicians fail to notify the family of a tuberculosis patient of the danger of infection and how this may be prevented, or else do not sufficiently impress them with the necessity of carrying out the prescribed precautions. "To give proper instructions to provide for the safety of all individuals occupying the same house or apartment" with the tuberculous sick is made a duty by law, and hence is mandatory upon the physician (New York Laws 1908, Chap. 327). In cases not attended by physicians this legal duty falls upon the health officer. As a provision to assist the health officer in this direct personal instruction, the New York law (Laws of 1913, Chap. 551) states that "any physician may report the name and address of any person coming under his observation who appears to be suffering from tuberculosis to the health officer," and the health officer gives the necessary instruction or orders.

THE PREVENTION OF TUBERCULOSIS FROM AN ECONOMIC STANDPOINT.

By MARY E. LAPHAM, M. D., of Highlands, N. C.

Present Beliefs.—The whole of the campaign against tuberculosis is based upon the single belief that tubercle bacilli cannot live outside the human body, and that, therefore, their transmission from case to case is the only possible way that the disease can be perpetuated. Sputum is believed to be the chief agent of this transmission and its destruction the most important factor in preventing exposure. We believe that if every case of tuberculosis could be placed upon an island and if every tubercle bacillus derived from human sources could be killed, we should absolutely annihilate tuberculosis. Protection from exposure to tubercle bacilli derived from human sources is the main end and aim of all our tuberculosis work. We believe that if we could obtain complete protection against exposure from human cases we could entirely obliterate tuberculosis. This point is emphasized by Red Cross Seal Societies, by Governors in their proclamations, and by the leaders in tuberculosis work. As Huber says, "All we need is sufficient cooperation to make the great White Plague nothing but a ghastly memory."

Are These Beliefs True?—Before demanding for the sinews of this warfare more sanatoria, more beds, more district nurses, more milk and eggs, let us carefully question the truth of the beliefs upon which all these demands are based. Is it true that tuberculosis can ever be annihilated? Is it true that tubercle bacilli cannot live outside the human body? Is it true that transmission from case to case is the only way that the disease can be acquired? Is it true that sputum is our greatest danger? Suppose there was no sputum, could tuberculosis be perpetuated?

The Facts in the Case.—In criticising our present methods, let us ask first of all how much is known concerning the tubercle bacillus. If we ask a leader in tuberculosis work, the answer will be: we know that the cause of tuberculosis is the specific organism discovered by Koch and that it exists nowhere outside the human body save in laboratory experiments. If we ask a laboratory worker sufficiently interested in the question to be well informed, we shall learn that an entirely different attitude prevails in the scientific world. The laboratory worker will tell us that the prevalence of tuberculosis throughout the animal world throws a strong light upon the infection of the human race by tubercle

bacilli. The very fact that fish, frogs, toads, turtles, snakes, lizards, birds, poultry, sheep, pigs, dogs, cats, and cows, all have tuberculosis caused by tubercle bacilli showing marked family relationships proved by biological reactions, raises the question as to whether all these varieties of the same disease are caused in each instance by a distinct variety of tubercle bacilli imperatively restricted to its host, and perpetuated by direct transmission from host to host with no power of existence outside its own line of transmission, or whether all these manifestations are simply different expressions of the same cause. The man of science suggests that it would seem very illogical to assume an entirely distinct origin for all of these forms of tuberculosis when the bacilli show so plainly that they all belong to one and the same family, and that it would be much more logical to infer that so universal a manifestation must be due to a universal cause, and therefore tubercle bacilli are not to be regarded as the peculiar property of mankind but as the common cause of tuberculosis wherever it exists. Viewed from this standpoint, the well-nigh universal infection of the human race by tubercle bacilli is simply part and parcel of a common manifestation of a common cause. In no other way can we explain the practically universal infection of all children by the time they reach maturity. Hillenberg, studying in an exceedingly healthy hill district of Germany, found that 25 per cent. of all the children were infected with tubercle bacilli, although there had not been a death or even a case of tuberculosis in the district for ten years. Can these infections be explained by direct transmission from case to case, and where is the influence of exposure? This district was supposedly free from tuberculosis, and if the direct search had not been made, these infections would never have been revealed. Many surprising discoveries have been recently made in the tissues of the newly born and even of the prematurely born. Routine examinations have found tubercle bacilli in great numbers when there was not the slightest trace of tissue changes. More than this, when the adult bacillus of Koch could not be found, the tissues were nevertheless swarming with the earlier and pre-bacillary forms. Before we can determine whether an infection by tubercle bacilli is or is not present, we must be able to detect them in any stage of their life history. This life history begins to seem very complicated and characterized by a regular series of developments leading from a granule to the rod-shaped organism. During this process of development, the chemistry of the organism changes so that one staining reaction does not suffice to detect all stages, and frequently inoculation alone will reveal what the technique cannot disclose.

The Significance of These Facts.—We know that 75 per cent. of the children in the Boston Public Schools are infected by tubercle bacilli, and we may well ask, Is this because they have each been

exposed to a case of tuberculosis or inhaled tubercle bacilli from sputum? Has each case been caused by direct transmission from another case or have all these children simply experienced an infection common to all because of a common source of supply? From the standpoint of the universal infection of our children, our beliefs concerning transmission and perpetuation only by means of sputum and from case to case seem childish and hopelessly inadequate. It is more logical to infer that the universal infection of the human race by tubercle bacilli is comparable to that by colon bacilli, because the source of supply is equally universal and equally unavoidable. What should we say if we were asked to believe that each case of infection by colon bacilli was due to direct transmission from some other case, and that if we could sufficiently co-operate we could annihilate coli infections. Would any one for a moment assert that infection by colon bacilli could in any way be prevented? Should we ever dream of even attempting to prevent this infection? Is it not possible that attempts to prevent either of these infections would be equally futile? Since practically all children are infected by tubercle bacilli, the tuberculosis of adults must be due to secondary infections or to the delayed manifestations of a process existing from childhood, or to a combination of both. It is probable that a secondary infection would be much more likely to cause tuberculosis when grafted on to an existing process, and might otherwise, unless favored by existing lesions, be as harmless as primary infections usually are. Since the integrity of the lung is the best protection against the dangers of persistent secondary infections, would it not be well to know whether our children's lungs have been injured by these universal, primary infections? Periodical examinations of all our children would tell us which were menaced by tuberculous processes, and we should then know that these children must not be exposed to dangers which would be harmless for children with sound lungs. The detection of these dangerous processes in childhood and their correction would not only be the greatest safeguard for the future of these cases, but we should also be able to study the effect of these recoveries upon the future death-rate of adults from tuberculosis. It is quite possible that these recoveries secured in childhood might correspond to a lessened death-rate of adults, and that in saving the child, we have saved the wage-earner. Moreover, the periodical examinations of all children would correct the greatest fault in our tuberculosis work, and overcome the greatest danger of tuberculosis—the failure to detect the beginnings of the disease.

The Greatest Danger.—There are over twenty million school-children in the United States, and the problem of protecting them, and through them our future adults, is difficult to solve. A certain percentage of them will manifest tuberculosis in childhood, and we should put them into open-air schools, feed them properly, send

them into the country, and see that the danger is overcome. By far the larger percentage will give no sign of the danger, and no one will suspect that the ordinarily harmless presence of tubercle bacilli is causing tuberculosis. What we have to fear most of all is that the change from a harmless to a malignant condition will not be detected until too much harm has been done. The absolute lack of manifestations in these cases constitutes the real danger from an infection by tubercle bacilli. The great problem is to know when this infection becomes dangerous, and this is precisely what our present methods ignore. In some cases, even the smallest focus of disease causes such a marked effect upon the child that we endeavor to discover the cause. A spot so small as to be detected only with difficulty by the *x*-ray may affect the mental, moral, and physical tone of the child so markedly as to betray the danger. The pale, anemic, listless child, with lack of strength or initiative or any other tangible suggestion, will soon be detected by our public school system of medical inspection, but the well children escape observation because there is nothing wrong to suggest it. The real danger from tuberculosis is not so much with the unfit as with the sound, well children that are so strong and vigorous that we would scorn the very idea of their being in danger from tuberculosis. *It is from the ranks of well children that the tuberculous adults of the future are being recruited.* The sickly children fall by the way and are weeded out; the well ones go on, and later on, in adult life, manifest processes which have been developing for years. When a man in middle age comes crashing down with tuberculosis and we discover all at once that his working days are over, it is not because he has 'contracted' the disease so suddenly, but because the end has finally come of long years of preparation during which the tuberculous processes were extending from point to point in microscopic extent, but with fatal precision. Through all these years we might have discovered this danger at any time if we had known enough to look, but there was no sign, and so it never occurred to us that there could be any danger. If only the beginnings of tuberculosis caused as distinct signs of danger as the beginnings of coli inflammations, we should not be cursed with this disease as we now are. It is because we do not know when tuberculosis begins that we die. Because these beginnings are so subtle and insidious and their extension so devoid of all signs of danger, the lung is slowly destroyed before we have the slightest suspicion of danger. Until we can prevent tuberculosis as we prevent typhoid, our best protection is in the discovery of the danger while yet it may be overcome. Delayed diagnoses are the cause of deaths from tuberculosis, and the diagnoses are delayed because we demand some indication, some suggestion of the danger before we think to look for it. We argue that good health is in itself an indication that

there can be no danger from tuberculosis, and is indeed the best prevention against it. Keep up your resistance and you will have no tuberculosis is a fatal fallacy in our tuberculosis beliefs. Far from being a proof of safety, good health may be the very cloak behind which tuberculous processes are enabled to extend until it is too late.

One Million School-Children Have Tuberculosis.—According to Allport, out of twenty million school-children one million have tuberculosis. How are we to know which five out of every hundred are doomed, unless we examine them all regularly in order to detect the first beginnings of danger. Since it is impossible to avoid infections, all we can do is carefully to watch and be certain that they are causing no harm. The only logical way to know that a child is safe and to protect it from tuberculosis is to examine it regularly. The detection of tuberculous processes, in their very inception, offers the best protection for our citizens. Instead of doing this, we wait until the disease manifests itself and then clamor for money to care for advanced cases in order to protect the community. We have been permitting tuberculous processes to do their worst because we were ignorant of the real situation, and now we must pay for these blunders. We must look after the victims of our ignorant neglect and relieve suffering and induce recovery, but we should see to it that no more of these blunders are made. Some day it will be regarded as an unpardonable crime to permit tuberculous processes to develop until they become dangerous. Every physician must comprehend the necessity for periodical examinations of the children in his district by someone capable of making them, and should thoroughly instruct his community in the necessity for making these examinations so that cooperation may be secured. Until we have more skill in the rank and file of the profession, these examinations should be made by an authorized expert and the records carefully kept. These would secure us vital statistics of the extent of these conversions of childhood infections into tuberculosis and the effects of overcoming these conversions. It is very probable that the tuberculosis of adults could be better understood through these statistics and better prevented than in any other way.

Cost to the Tax-Payer.—In the business world it is fully realized that mistakes cost more than competent inspection. What are our mistakes costing us in tuberculosis work? McSweeney says that ten million cases are dying from tuberculosis, and if we estimate the expense of each case at one hundred dollars only we have a loss of a billion dollars. Who pays for all these losses? Whether from public or private sources, it has to come eventually from the pockets of the producers of the wealth of the country. Every year we spend twenty millions of dollars upon caring for the manifest cases; how much are we spending to prevent the develop-

ment of tuberculous processes into manifest cases? Who pays for hospitals costing millions of dollars? Why do not the tax-payers rise up in their wrath, and declare unwillingness to support hospitals that are monuments to our incapacity to prevent their being needed? Why do not the tax-payers demand information as to the most scientific way to prevent all these losses instead of being content to palliate them? Where is the scientific commission to inform us whether we are really working in the best way, and whether the beliefs of thirty years ago are adequate to guide us or whether new discoveries demand new methods? We are going blindly on, working along just the same lines that were laid down by Koch thirty years ago, and it is possible that these methods need changing. Suppose Koch had had another point of view and had said: "Since cows and many other animals have tuberculosis, we must not rest content with the knowledge of our infection, but seek its explanation in its relation to similar manifestations in other forms of life." Suppose Koch had said: "The tubercle bacilli of one manifestation are genetically related to those of all other manifestations and therefore we must study this relationship before we can know anything definite concerning our own variety." If Koch had seen this when the question of bovine infection came up, what a world of mistakes and deaths and evil consequences might have been saved.

Practical Conclusions.—Our tuberculosis work is based upon traditions of thirty years' standing, and is carried on to-day in defiance of knowledge and scientific insight just because we are content to go on without this knowledge. Our practical work is governed by wrong conceptions. Instead of realizing the necessity for more insight and urging the appointment of a scientific commission to inform us concerning the life history of our enemy and the best way to defend ourselves against its attacks, we insist that we know all there is to be known and scout the suggestions of European workers that the bacillus of Koch is but one of the many forms requiring thorough comprehension. Our State Boards of Health are constantly making diagnoses as to the presence or absence of tubercle bacilli in sputum in accordance with the adult bacillus of Koch and regardless of all the other stages of its development. Why ignore fundamental facts and content ourselves with superficial work?

The prevention of tuberculosis demands thorough study. We must know the source of infection of cows, poultry, birds, and the lower animals. We must know whether the infection of mankind is part and parcel of a universal phenomenon and what bearing this has upon our protection. We must know whether it is best to go on as we are, waiting until the disease manifests itself, or whether we shall make periodical examinations of our children in order to detect the danger at the earliest possible moment.

One city or state should not undertake this study, but it should be done by the Federal Government for the good of all. Why does not the United States see the economic importance of solving these problems and appoint a scientific commission to do so? Let us know the truth or falsity of the statements made by van Calcar, Much, Ferran, Kræmer and many others. Give us full and abundant knowledge concerning the life history of our foe and its methods of attack—knowledge which shall come from coordinated efforts and not from scattered findings. The full significance of all the work now being done in European laboratories can be appreciated only when properly coordinated and presented. What we need is to get the matter so impressed upon the minds of the taxpayers that eventually they will force it upon the attention of the Federal Government. Then if Congress will do its duty and go about it with the vigor with which it attacked the mosquitoes in the Canal Zone, the problem of preventing tuberculosis may be solved. Our most urgent need to-day is a statesman who will hammer at Congress until a National Scientific Commission has been established to study these questions. Could Gorgas have stamped out disease in the Canal Zone by waiting for well-developed cases of yellow fever and then curing them, or catching the fully grown *stegomyia* and choking it with kerosene? One year's losses from tuberculosis would build three Panama Canals, and yet we make no effort to get at the facts in the case.

THE LOCATION AND CONSTRUCTION OF A SANATORIUM FOR THE TREATMENT OF PERSONS SUFFERING FROM TUBERCULOSIS.

By ISAAC W. BREWER, M. D., of Taughannock Falls, N. Y.

One may have ideals regarding a sanatorium, but, when it comes to the practical work of location and building, it is often necessary to sacrifice some of the cherished ideals in the interest of economy, utility and administration.

There are too few sanatoria for the treatment of tuberculosis in the United States. Not only do they afford the best chance for the recovery of the patient, but they are potent factors in the prevention of infection. In general, it may be said that every community of 30,000 or more inhabitants should have a local sanatorium, but before establishing one it is well thoroughly to canvas the question and see whether the local cases cannot be more economically cared for in a nearby institution. In such an event the local project should be abandoned. However, it is believed that the local sanatorium idea is the correct one, for as a rule patients desire to be treated close to their homes where they can see their friends and relatives frequently.

With small institutions the overhead charges are proportionately very great, and it is difficult to manage them with the small number of helpers that the appropriation will allow.

The survey of the territory before building should not only include the best location for the buildings, but the number and probable source of the patients should also be ascertained. The character of the cases to be treated is also to be considered. For far advanced cases which are practically hopeless, the institution may be located within the city or very close to it, but it should have grounds sufficient to place a bumper of green grass and shrubs between the buildings and the street or road.

For institutions that are to take all classes of cases, we must locate to the best advantage of those who may be successfully treated. The writer believes the location is of the utmost importance, and many excellent institutions have been seriously handicapped by their location. Only recently, the writer visited an institution that was situated in a most inaccessible portion of the city. It could only be reached by passing down a dirty, muddy lane. The outlook was far from pleasing and the institution has rarely been half full, although there are hundreds of needy cases in the town.

It cannot be too strongly emphasized that the outlook must be very pleasing. Many of the patients will spend months on the porches, and if they look out on a 'poor-house' or on rubbish heaps, the surroundings will be reflected in their spirits. If the porches command a view of a road, the passers-by will greatly interest the patients and you will get more support from the local community.

The writer does not think there is much of therapeutic value in mere elevation, certainly not in the moderate elevations to be had in the eastern portion of the United States. There is a decided advantage to an elevation that commands a view of the surrounding country.

Many persons believe that a sanatorium should be located amongst the pine trees. While the aroma of pines and balsams is delightful, there is no therapeutic virtue in the exhalations from these trees, and if the pines be too thick it makes the surroundings gloomy. However, the green of pines during the winter and the beauty of the new shoots in the spring are so pleasing that they should be in the grounds in considerable numbers.

The writer's ideal location of a sanatorium in which all classes of patients are to be treated is a southern slope of a hill, that commands a view of a lake or stream. It should be protected from the winter and spring winds by a pine grove. Close to the house should be a well-kept lawn and in the distance fields of wild flowers. There should be a well-kept wood belonging to the sanatorium.

Let the distant view command a mountain range or some high hills. Most of the Adirondack sanatoria are ideally situated in this respect, especially Stony Wold.

The tendency in this country has been to locate at points remote from cities. This is a great mistake from almost every point of view. One of the greatest objections to this is the difficulty with which the friends of the patients can get back and forth. If close to the city the institution will be better known and will be better supported by the public. From the administrative end it is also very undesirable to be located at a distance from the city. The question of supply is very difficult in the country, and it is frequently impossible to obtain vegetables and fresh fish. The writer would, therefore, say that the source of supply must be considered in choosing a location.

There are drawbacks to locating close to a city. One of these is the facility with which the patients can obtain alcohol and the danger of their absenting themselves without permission. These can be obviated by proper administrative measures, and the writer believes that the sanatorium should be located on a suburban trolley road, and if possible within the five cent zone.

Twenty years ago a good deal was said about the relation of soil to tuberculosis, but we hear very little of it now. Certainly the results obtained at the seashore prove that dampness of the

air is not an important factor. However, it would be unwise to locate on low damp ground, for many reasons, but principally because of the mosquitoes and because the number of days when the patients can be out and about the grounds will be reduced.

An abundant water-supply is essential, and if possible the location should have the advantages of water from the city supply. Where this is possible, endeavor to get a gravity supply, as pumping is expensive and liable to fail at any time. For small plants a filter is almost prohibitive.

The question of help is very important and if too far from the city it will be very difficult to keep good help.

Lay committees nearly always advocate remodelling an old building, but from bitter experience the writer's advice is to avoid such a thing. Rarely is a building adaptable to any but the purpose for which it was built, and when remodelled you will not have what you want. Occasionally an old building can be used for administrative purposes, but as a rule you never have what you want. It is far better to build from the ground up and have just what you need. The plans should be drawn by an architect, who will charge about 5 per cent. for his services including inspection, but he will save that much in the repairs.

Some one introduced the word 'shack' in connection with the building of sanatoria, and whenever we hear of such an enterprise there is a lot to be said about 'shacks.' The writer only mentions them here by way of condemnation. They fulfil none of the requirements for housing patients with tuberculosis. They are rough affairs, difficult to keep clean, and are cheerless, producing just the air we wish to avoid. The writer has never seen a satisfactory 'shack.'

The object of a building should be to provide a warm place for dressing, bathing, and eating, and an infirmary for those who are dying. These the 'shacks' do not do.

The tropical bungalow is the type of an inexpensive building for a sanatorium. It should be but one story high and face southeast, and have verandas fifteen or more feet wide. The roof at the eaves of the veranda should not be over 7 ft. high, but there should be ventilators in the roof of the veranda. The writer prefers to have the building divided into rooms that are 10 by 12 ft. with doors opening at each end so that the beds can be pushed out and in with ease. The ceilings need not be over 9 ft. high, and the windows and doors should come to the ceiling. There should be a transom over each door and window. If the veranda runs all around the building it facilitates sleeping out as one is always possible to be on the lee side of the building. A very good plan has been incorporated, in some of the sanatoria, of having the porch extend 6 or 7 ft. beyond the roof so as to provide for sun-baths

in cold weather. The entire building, including the porches, should be protected with fly screens.

Steel lockers built into the walls are better than wooden ones, and there should be one for each patient. These should be ventilated, but at the same time it must be possible to close them up tightly so as to fumigate the patients' clothing in them.

The toilet facilities are often slighted by the building committee. They should be ample and should be in separate compartments. Spring faucets will save a great quantity of water. Shower baths are very desirable, and save a lot of water. Never omit to place a slop sink in each toilet-room and in the halls if they are large.

The color of the paint is important. An ivory color will give the effect of sunshine and make things more cheerful.

Electricity is, to the writer's mind, the only light for a sanatorium. He has used acetylene, but finds it very troublesome and advises against its use.

The question of heating will be a troublesome one, but the rooms must be kept warm. You cannot keep patients in the open air all day and all night without providing a warm place where they can dress and come in to warm up when chilled through. By keeping the rooms at 65° F. you will be able to keep the patients outdoors at least seventeen hours during the day.

A large dining-room is a decided disadvantage. Not a few of the patients who come to free sanatoria have such bad table manners that they cause disgust of food in others, and for that reason the writer prefers to segregate them according to their manners and to their friendships.

An infirmary must be provided, for it is very discouraging to have dying patients in close contact with those who are yet hopeful. There should be an office for the nurses and combined with it a chart room.

No sanatorium should be without a laboratory and an examining office.

Children should not be taken into the same institution with adults unless special buildings are provided for them; the writer finds many objections to mixing them. Where children are taken, special attendants must be provided to supervise them, but these persons need not be professional nurses.

Upon the character of the help will, in a large measure, depend the success of the sanatorium, and one cannot be too particular about providing them proper quarters, which should include a recreation-room.

You cannot have too many store-rooms. It is surprising how many things accumulate in a short space of time, and they must be properly cared for or lost.

Local committees generally desire to operate a farm in connection with the sanatorium, but unless the institution be a large

one they are generally operated at a loss. Farming requires ability that the usual physician cannot be expected to have. A garden is, however, essential to the management of the institution and can generally be operated, without great expense, by utilizing the man who attends the fires.

Before a patient is discharged from the sanatorium he or she should be able to do hard work, but unless a workshop is provided this will be impossible in most cases. The writer has had patients do odd jobs about the place, such as work in the garden, grading, and sawing wood. It has not been a success.

Most of the sanatoria in New York State, which the writer has visited, have the buildings too widely separated for economy in administration. With the small number of nurses allowed, one cannot supervise patients in a building a half or a quarter of a mile distant. Without constant supervision they will not stay out during the coldest weather. It seems that a distance of 50 ft. is sufficient between buildings, and probably a shorter distance will be better. All buildings should be connected with the main building; the dining-room and recreation-room by a covered way, thus affording protection during bad weather. This is most important, as will be realized if you are called out at night during a blizzard to visit a building at a considerable distance. The advocates of magnificent distances say that the outlying buildings are for incipient cases only, but it takes but a few moments for an incipient case to have a hemorrhage and be at death's door, as the writer has learned to his sorrow more than once.

Next to the cure of the patients and the protection of the community, the great point about sanatorium administration is to purchase cheaply and to utilize as far as possible all wastes. Most sanatoria utilize their garbage for feeding pigs, which is all right provided it be properly sterilized, and the pens be maintained so that they do not become the breeding places for flies.

Every sanatorium should be provided with an incinerator for the destruction of sputum cups and handkerchiefs. If combined with the water heating-plant, they save coal.

THE FEEDING OF THE TUBERCULOUS. (A FEW SUGGESTIONS.)

By CHARLES RAYEVSKY, M. D., of Liberty, N. Y.,
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Pulmonary tuberculosis belongs to the class of wasting diseases. Emaciation, true enough, may also be the result of other diseases; it is also a fact that quite often we meet individuals in the incipient and even in the advanced stages, that do not show any loss of flesh; more than this, we quite often find the tuberculous whose weight is above normal; but this latter class of patients is the exception, for, as a rule, they have been either overfed as soon as the prodromes of the disease were noticed, or they were by habit gluttons.

In pulmonary tuberculosis we have to deal with an infectious disease caused by an invading host, whom through treatment we try to dislodge, to entrap, or overpower. This is our usual line of treatment—be it the old time specifics like creosote, guaiacol, or other similar expectorants, be it arsenic, calcium salts or others that were believed to assist in the encapsulation of the diseased foci, or be it the latter-day specifics, the tuberculins, that are believed to raise the resisting powers in our system. There is no doubt that we must use therapeutic agents, among which fresh air is certainly of much importance.

All these, though, will not replenish the tissue waste, and patients may easily waste away, while we are trying our best in fighting the invading enemy. The wasting of tissues is one of the main characteristics of the disease in untreated cases; it is also the most dangerous symptom if it is obstinate and unamenable to treatment.

The only agent that replenishes the waste is food; and the feeding of the tuberculous will forever remain the most important element in the treatment of pulmonary tuberculosis. In the feeding of the tuberculous several questions must be considered, among which are (1) the patient's palate, (2) the methods of serving food, (3) the amount of food, (4) the kinds of food.

The last two questions have been considered from many sides by different authors, the literature is quite rich on these questions, but far from being too rich; the first two questions have not been dealt with much, neither in literature nor in practice, and the consideration of these will be the object of the writer's paper.

To please the patient's palate should be the first thing attempted, if we intend the patient to derive the most benefit from the food served him. The most nourishing food eaten without a relish or at

least without some sort of an appetite, will remain in the alimentary tract much longer undigested than otherwise, and as such it will be a source of discomfort to the patient; a great deal of this food may also pass out only partly digested. There must be a *rich variety* of food to make it palatable and appetizing; all dishes served should at all times have a different flavor, and must be served in an attractive and dainty way.

The race and nationality of the patient must be taken into consideration. Each race and nationality have their favorite dishes, have their own way of preparing them, their own method of flavoring, and even in serving are apt to have a different way. Every race has its own most stable foods: so the Russian enjoys best his bread and beef, the Irish his pork and potatoes, the Bulgarian his cheese and peppers, the American his cereals and pastry, the Finlander his fish and so forth, each race and nationality according to the climate of the land it comes from, and according to what food is obtained more plentifully in its native land.

In this great republic of ours we have to deal with patients of different nationalities, and the writer has failed to find the Cuban who fully enjoyed his meals in an American boarding-house, a German in a Hungarian café, or a Russian in an Italian restaurant. The writer had numerous occasions to see American college-bred young men and women leave in disgust some of our best American sanatoria, heard their numerous bitter complaints about the food served them there, and according to the writer's observations the only reason of these complaints was that these patients have been brought up by their immigrant mothers, and fed on foods and dishes prepared and flavored and served, according to the customs of the countries their mothers came from.

Many of our sanatoria in the East and Middle West, be they state institutions or those supported by private charity, are filled with foreign-born or foreign-fed people, and if it is desired that they should get the most benefit from their food, their palates must be taken into consideration; often we may find a mixture of nationalities in one sanatorium, but we can always find the predominant one, and it is to the tastes of these that we must cater. There will certainly be some of the other patients of the different nationalities, who will be dissatisfied with the food, and for these some individuality to the dishes should be given. But should the exceptions be of a goodly number and of a homogeneous race another cook should be engaged to satisfy their wants.

The question of serving and arranging the patients in the dining-room is a matter of no small importance. While good appetite exhibited by nearby patients is sometimes a good stimulant for those who suffer from anorexia, the reverse has also been noticed; and it is still an academic question, which is the more infective, the good appetite or the anorexia. The writer's experience teaches him that

anorexia is the more serious, if not the more common infection; he therefore considers it risky to place at the same table patients with good appetites in close touch with such who are poor eaters.

Another drawback against placing patients in haphazard fashion is the patient who is too scrupulous and suspicious about the quality of the food or the cleanliness in its preparation. To place him with others who are not of such character is dangerous; such a patient may set aside a nicely prepared dish for the minutest little speck in the food or on a plate, and though he may not pass a single remark to his neighbor and even try to hide his findings, it will be noticed by other patients who may easily follow his example.

There are two ways of arranging the patients at table, one is to place the tables in a continuous row; if such be the method, the physician, the nurse, or one of the authorities should sit at the head of the table; his or her presence and the fact that their superiors eat with them and the same food, will do away with most of the complaints against the food. This democratic way will also bring the patients into closer and more friendly relation with the medical staff, and inspire them with greater confidence in their superiors, which in itself helps the physician to treat the patient.

The second method of arranging the patients at table is to seat three or four at each table by themselves; it is more homelike, and therefore preferable; it does away with unnecessary talking during meal-time, and with the infection of anorexia or of unscrupulous demands by some patients. Each table must be served complete, there should be no handing over even of a bottle of water from one table to another. There should be some space between the tables to prevent as much as possible the communication between patients during meal-time; this ample space will also give plenty of room for the waiters to pass and serve the patients properly and comfortably.

The cups, glasses, plates, etc., must be perfectly clean, and each should be examined just before or while it is being placed on the tables. A just complaint by one patient will produce several unjust ones. Be the dissatisfaction just or unjust, it surely does not promote good appetite and digestion, but interferes with enjoying the full value of the food.

While patients are expected to be at their meals at a certain time, they cannot all come at once and to the minute; hence, the serving of the food should not be done mechanically beforehand, by simply so many dishes with one thing or another. The patients should be served individually or in pairs, at no time more than four, and not before the patient has seated himself comfortably at the table, so that the hot food served shall not be cold before he is ready to eat it.

Forks, knives and spoons should not be of an easily oxidizable metal, as the oxide sometimes leaves traces on the food, since the

cleaning of the tableware is not always possible just before the meals are served.

The waiting on the patients must be conducted with unscrupulous cleanliness; the waiters should be dressed in white, have their hands washed and finger-nails cleaned before the actual beginning of serving food to the patients. The waiters must be polite; they, as well as the other employees in charitable or state institutions, must bear in mind that the unfortunate one whom they are serving, though a recipient of charity, is still a part of the people or of the community that employs him (the waiter) or the other employees.

A great majority of tuberculous patients are very much afflicted with the mania of getting a new infection, and this fear causes some of them to be over-scrupulous in their demands for cleanliness from others who come in contact with them.

The usual trend of opinion is that the patient must be fed according to the social status he was in before he entered the sanatorium. There seems to be a fear that if the patient should get used to better food and better immediate surroundings, he will get used to luxuries he does not and is unable to get at home, and that on discharge he will be unfit to return to his former mode of living. The writer believes these opinions and fears erroneous. If these fears be correct, then it is wrong to remove the patient from his filthy quarters in the tenement house, and place him in the sanatorium in free and open country air, as he also gets used to it and may not like or be unable to continue to live in the closed rooms of the tenement; still we have no fear of it, and act exactly the reverse; we teach him to live as much in the open as possible, so that when he returns to his former environments, he should try to improve them, keep his windows open, spend his time in the open as much as possible, take rest, avoid hilarity, etc. The same must be said in reference to his food and cleanliness. He will try to bring the conditions of his feeding at home as near as possible to those in the sanatorium; more cannot be expected.

One thing more and the writer will conclude. Anorexia in pulmonary tuberculosis is certainly one of the most distressing symptoms. Nothing will stimulate the appetite better and with it aid digestion more than a dainty served dish. We shall hardly have an occasion to resort to Debove's method of introducing food through a tube, if dainty dishes are tried first.

We never stop at the cost of keeping up as good a laboratory as possible; no cost deters us from employing any remedial agent; we refuse to be hampered in our work by the high cost of the proper and scientific disposal of our sewage and garbage in the sanatoria; no cost deters us from employing any measure in treatment that we consider of service; therefore we ought not begrudge the expense for the most important agent in the fight against pulmonary tuberculosis—the agent that replenishes wasted tissues, the wholesome, palatable, daintily served food in comfortable and cheerful dining halls.

CLIMATE AND ITS RELATIVE IMPORTANCE IN THE
TREATMENT OF PULMONARY TUBERCULOSIS.

By JOHN W. FLINN, M. D., of Prescott, Arizona.

The essential factors in the treatment of pulmonary tuberculosis may conveniently be grouped under two general heads: (1) Care, and (2) out-of-door life.

Under the first may be included (*a*) rest or carefully graduated exercise, (*b*) good food well cooked and nicely served, and (*c*) systematic hydrotherapy. The second comprises those elements which make life in the open air comfortable and pleasant. In these days of superior railway facilities it is possible to provide 'care' almost equally well anywhere; but facilities for the 'out-of-door life' vary greatly in different parts of the world.

In estimating the value of any climate for the treatment of pulmonary tuberculosis, the paramount consideration is the amount of time which it permits the patient to spend in the open air with comfort and pleasure; the opportunities which it offers for a comfortable and pleasant out-of-door life. In tuberculosis, the important question is, How many pleasant days are there in the whole year? Speaking generally, the ideal climate for the treatment of pulmonary tuberculosis is that in which the patient can spend twenty-four hours out-of-doors, with comfort and pleasure, every day in the year.

The special qualities which influence the character of climate are (1) temperature, (2) humidity, (3) sunshine, (4) atmospheric pressure and air movements, (5) soil and forests.

Temperature.—Speaking generally, cold climates are invigorating; hot climates enervating. As the basis of the modern treatment of pulmonary tuberculosis is the hardening process, one would naturally conclude that cold weather would prove more beneficial to the tuberculous patient than warm. Clinical observation confirms this view. It is the almost universal opinion of clinicians that patients who have tuberculosis make more improvement in the winter season than in the summer; and this even in the more rigorous climates. "Like cold tubs in typhoid, cold air in pulmonary tuberculosis is a great nervous sedative, for it abstracts heat, especially when in motion." "Weinzirl has shown that cold is an important factor in the production of the blood changes at high altitudes."¹ Indeed any degree of cold which does not interfere with a comfortable and pleasant out-of-door life is desirable, and the patient's comfort depends not on the physical but on the sensible tem-

perature which, in turn, is dependent on the relative humidity of the atmosphere and the wind movement.

Patients differ greatly in the degree of cold in which they can live comfortably in the open. Weakly and emaciated patients do better in the milder climates, but the great majority of those in fair physical condition enjoy life out of doors, whether resting or exercising, even in zero weather, if the relative humidity of the atmosphere is at all low. Certainly the most desirable temperatures for the majority of tuberculous patients are the cool and dry in summer and the cold and dry in winter.

Variability of temperature (found associated with dryness and altitude) is now recognized as a distinct benefit in pulmonary tuberculosis. "The most important climatic element for the cure of consumption is a daily variation in temperature of more than 20° F., which acts on the organism in a way to produce conservative reaction against further bacterial invasion."² Brown says an average diurnal variation of at least 20° F. is one requisite of a good health resort for tuberculous patients.³

Humidity.—Dryness of the air is a strong incentive to out-of-door life in that it effects markedly the sensible temperature of the atmosphere. The feeling of heat and cold is much less noticeable in dry than moist climates, and for this reason living out of doors is more comfortable whether the day is hot or cold.

Moreover, owing to the unimpeded progress of the sun's rays through a dry atmosphere (there being little moisture in the air to absorb the heat) there is a marked difference in temperature between the sunshine and the shade. The consequence is that one can remain very comfortable in the direct sunlight when the physical temperature is quite low; while, when the thermometer registers high, shade ensures a comfortable sensible temperature.

Huggard⁴ states that the chief therapeutic effect of climate lies in its power of abstracting heat from the body. Increased heat dissipation calls for greater heat production, which is brought about by increased oxidation. This increase in the oxidizing processes demands greater functional activity of the organs of the body. This in turn produces better digestion and assimilation, with increased metabolism and improved nutrition. Differences in heat dissipation vary greatly according to the relative humidity of the atmosphere. The significance of this lies in the fact that the heat abstraction of dry climates, brought about by radiation and evaporation, is much better controlled by the body and in general has a more beneficial effect on nutrition than has that of moist climates in which conduction plays the important rôle.

Sunshine.—No other single climatic factor is comparable to sunshine in furnishing the lure to the out-of-door life. Other things being equal, the greater the percentage of sunshine the more comfort and pleasure there is in life in the open. To all patients a

sunny day is a pleasant day and a cloudy day a disagreeable one. The very words pleasant and disagreeable as applied to the weather indicate how strongly one's feelings are affected by the presence or absence of sunshine.

As direct sunlight is a powerful germicide, an abundance of sunshine ensures a low bacterial content in the atmosphere. Sunshine is one of the most important factors in the production of pure air which is so essential in the treatment of diseases of the lungs. Secondary infections in pulmonary tuberculosis are much less frequent in a dry sunny climate.

Moreover, light has an invigorating effect on the vital processes. It increases both the hemoglobin and the red blood corpuscles, and causes the hemoglobin to give off its oxygen more quickly. Thus, one of the advantages of life in a cool, dry, sunny climate is that patients can spend their days in the open and so obtain the benefit of the influence of direct or strong indirect sunlight on the body.

Atmospheric Pressure and Air Movement.—The crisp, dry air, cool in summer and cold in winter, with an abundance of sunshine, which characterizes high altitudes, is a constant invitation to life out of doors and constitutes sufficient reason for considering these locations desirable for tuberculous patients.

In addition, the clinical results obtained in the treatment of pulmonary tuberculosis at high altitudes have for many years impressed physicians, who have had an opportunity to observe these results, with the belief that diminished atmospheric pressure has in itself a direct effect in the treatment of this disease. Barlow says: "The high altitude treatment is most successful in early cases and those with consolidation. It stimulates the whole system, lessens clinical symptoms, and brings an increase in weight." There is an increase in the number of blood corpuscles and in the amount of hemoglobin. The fact that a similar increase has been found in cases of artificial pneumothorax, is strong evidence that these increases are produced in response to a demand for more oxygen and, in the case of altitude, are in reality directly due to diminished air pressure.

Altitude increases the respiratory and cardiac functions, and hence a greater degree of rest is called for in active pulmonary tuberculosis. The secretions of mucous membranes are diminished, and in this way the cough is lessened and the lung given a greater degree of rest. It increases the appetite and stimulates proteid metabolism. Pulmonary hemorrhage is less prevalent at high altitudes. The number of lymphocytes is increased.

Constant air movement is found at high altitudes and assists materially in heat-abstraction with its invigorating effects.

Soil and Forests.—A dry porous soil is a distinct advantage in contributing to the desirability of the surroundings at all times, and especially after a fall of rain or snow.

The near presence of a forest is desirable in that it affords not only a pleasing outlook but also protection from high winds. It is especially to be sought for in the arid regions where it also ensures freedom from dust.

In a word, the climate best suited for the majority of uncomplicated cases of pulmonary tuberculosis should be cool in summer and cold in winter, with low relative humidity and constant air movement, at a high altitude, with an abundance of sunshine and absence of wind and dust.

The Relative Value of Climate.—We agree with Barlow that “in no other disease does climate play so important a rôle.” While it is undoubtedly true that some cases of pulmonary tuberculosis have been and are being cured in the most unfavorable climates, still as long as the out-of-door life is an essential part of the treatment of this disease, just so long will climate remain of paramount importance.

On the other hand, as between ‘care’ (as defined in the opening sentences of this paper) and climate, the latter must always continue to be a secondary consideration. In the least favored climate, good care, provided the surroundings be the best obtainable, will produce better results than the best known climate without the care. If the patient must choose between the two, he should take the care and let the climate go; but if he be so fortunate as to be able to have them both, his prospects of recovery are certainly brighter than they could be if he were compelled to depend on one alone.

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MEDICAL AND SURGICAL PROGRESS.

ROENTGENTHERAPY IN TUBERCULOSIS.

A REVIEW OF RECENT LITERATURE.

By E. H. SKINNER, M. D., of the Editorial Staff.

1. Boggs (*Amer. Quart. Roentg.*, Vols. I-IV, p. 58; *New York Med. Journ.*, Vol. 91, p. 380, 1910).
2. Baisch (*Klin. Therap. Wochenschr.*, Vol. 19, p. 613, 1912).
3. Dunham (*Fortschr. auf dem Gebiete der Roentgenstrah.*, Bd. 15, p. 180).
4. Fritsch (*Muench. med. Wochenschr.*, Vol. 60, No. 47, p. 2601).
5. Gibson (*Journ. Advanc. Therap.*, Vol. XXXI, p. 312).
6. Holding (*Lancet*, June, 1910).
7. Iselin (*Deutsch. Zeitschr. fuer Chir.*, Vol. 103, p. 483; *Deutsch. med. Wochenschr.*, Nos. 7 and 8, 1913).
8. Johnston (*Arch. Roentg. Ray.*, Vol. X, p. 284, 1906).
9. Kuepferle (*Fortschr. auf dem Gebiete der Roentgenstrah.*, Bd. XXI, p. 100; *Strahlentherapie*, Bd. II, p. 590).
10. Kienbæck (*Roentgentaschenbuch*, Bd. III, p. 96-119, Leipzig, 1911).
11. Leonard (*Journ. Amer. Med. Assoc.*, Vol. LIV, No. 20, p. 1596).
12. Mahar (*La Presse Méd.*, No. 20, 1910).
13. Pirie (*Proc. Royal Soc. Med.*, March, 1909; *Electro-Therap. Sect.*, p. 97).
14. Pfahler (*Therap. Gaz.*, Third Series, Vol. XXI, p. 1).
15. Pancoast (*Therap. Gaz.*, Third Series, Vol. XXI, p. 511).
16. Philipowicz (*Wien. klin. Wochenschr.*, Vol. XXVI, No. 51, p. 2115, 1913).
17. Poyet (*La Presse Méd.*, No. 16, 1910).
18. Roques (*Archiv. d'Electricité Méd.*, Vol. 21, No. 333, p. 57, 1912).
19. Schede (*Fortschr. auf dem Gebiete der Roentgenstrah.*, Vol. 21, No. 3, p. 341).
20. Wilms (*Deutsch. med. Wochenschr.*, Vol. XXXVI, p. 259).

The value of roentgentherapy in glandular tuberculosis, especially of the cervical and thoracic lymph-glands, is reported as extremely satisfactory by many authors. There are many advantages to roentgentherapy over surgical treatment alone, although there are incidents in the career of tubercular lymph-glands where surgical procedures may assist roentgentherapy. The addition of roentgen-

therapy to the surgical treatment of tuberculosis of the bones and joints has occasioned some enthusiastic reports which merit our attention. Again, the use of the Roentgen ray in pulmonary tuberculosis, which has received much notoriety at the hands of some American electrotherapeutists, may merit our more serious consideration if the recent experimental researches of Kuepferle find therapeutic proof in man. There are isolated case reports upon tubercular laryngitis in which roentgentherapy proved efficacious. Lastly the use of Roentgen rays in the superficial skin lesions of tubercular origin has always been reported favorably. We shall endeavor to group our discussion based upon the above literature under the following headings: Roentgentherapy in (1) tubercular lymph-glands, (2) tuberculosis of the bones and joints, (3) pulmonary tuberculosis, (4) laryngeal tuberculosis, and (5) dermal tuberculosis.

Tubercular Lymph-Glands.—There is such a wealth of literature upon this subject that it is difficult to make any selection for review. There appears to be a larger percentage of results reported by later writers, and the technique appears to be narrowing down to an intensive therapy or expeditive method (Kienböeck).

Among authoritative American roentgenologists we find that Pfahler, Pancoast, Leonard, Johnston, Boggs, and especially Pirie have presented this subject in convincing articles. In the hands of roentgenologists, who pursue a carefully measured roentgen dosage, we find most enthusiastic and uniform reports of satisfactory results, while some reports from surgical clinics where the Roentgen ray was probably applied indifferently or ignorantly are still tinged with surgical scepticism. It is noteworthy that in the articles which incorporate details of definite dosage the large percentage of cures and the scarcity of recurrences are most startling.

The cosmetic results of roentgentherapy receive much attention, for the surgical scars are lacking if the case be attacked before there are any fluctuating glands or sinus formations. It is generally conceded that the surgical attention to suppurating glands is necessary, but the immediate pursuit of roentgentherapy lessens the scarring and prevents keloid formations. In cases that receive surgical attention and present gross scarring and keloid growths, or have sinuses remaining, the vigorous application of the Roentgen ray usually clears up the case.

Leonard and others have called attention to the fact that in cases which clinically present themselves as cervical adenitis we usually may discover by roentgenoscopy that the bronchial glands are also involved. Where roentgentherapy has been applied, these bronchial gland shadows have disappeared along with the cervical glands. Pancoast has also reported instances in which apical signs of tuberculosis have cleared up when the cases were being rayed for tubercular adenitis and laryngitis. If we are willing to grant then that the original site of pulmonary tuberculosis is in the bronchial lymph-glands and that their presence can be determined by the clinical and roentgen examinations, we may consider our armamentarium against tuberculosis augmented by roentgentherapy.

As to the effect of roentgentherapy in tubercular adenitis, both Leonard and Pirie agree, first, that the opsonic index rises as the treatment is applied in proper doses, but if the treatment is too severe it may go into the negative phase and the steady progress of the patient toward cure be thereby retarded; and, secondly, that

roentgentherapy kills giant cells which are forming and affects the tissues of lowest vitality and assists nature to the development into fibrous tissue; and, thirdly, that the early destruction of the lymphatics isolates diseased lymph-nodes and prevents the spread of disease. Pirie reasons this way—namely, quickly growing cells are killed by Roentgen rays; giant cells are quickly growing cells; giant cells become inactive and harbor bacilli which remain unharmed by leucocytes. Therefore destroy the giant cell in its formative period and the tubercle bacillus will be without defense, and can be sought out and destroyed by the leucocytes.

Kienböck believes that there is a direct roentgen effect upon the lymphoid and granulation tissue of the tumors and not upon the blood-vessels; that there is a recession of cell activity, especially of the cell metabolism, which progressively produces an involution of the cells.

Roentgen Technique.—Pirie gives one-third the dose required to produce epilation once a week, measured by Sabouraud's pastilles and a control (Pirie's water meter). Pirie filters his ray with several thicknesses of towel. Kienböck gives very explicit directions for the Roentgen technique in tubercular adenitis, and as his method is so frequently referred to by Continental writers upon this subject, we shall describe this fully. Kienböck's technique (*Expeditivmethode*): (1) Medium soft or, better, hard rays above Benoist 6; (2) focus-distance at 20 to 30 cm. skin distance, and only in superficial glands should this distance be reduced; (3) filters of aluminum, glass or thick leather; (4) wherever possible irradiate from various sides or angles; (5) usually apply the maximal superficial dose (called by some the epilation dose, erythema dose, normal dose, etc.); (6) repeat this dose in three or four weeks. Continue this technique over months until the cure is accomplished. He advises this maximal dose at one sitting, as it permits a more exact control of the dosage, and he deprecates what he calls the primitive method of interval daily treatments until an erythema forces the abandonment up to the time that such an erythema recedes. Where the Roentgen installation forces the use of a greater skin distance and harder rays, Kienböck recommends a modified expeditive method, and divides the maximal dose over succeeding days or gives a third of the maximal dose every eight to fourteen days (see Pirie's technique above). Kienböck advises the measurement of the dose by Sabouraud's pastilles or some similar method, and favors the exposure of a larger area than just the palpable glands. Not only should demonstrable areas be rayed, but suspicious areas, such as the mediastinum and abdomen, should be included in the therapeutic attack. Another earlier description of technique by Boggs consisted in applying Walter 4-5 rays through an aluminum filter of unknown thickness, with 1-2 milliampères of current, tube 12-15 inches from the skin, for a twenty-minute exposure three times a week. Boggs admits that this method produces a slight erythema in three or four weeks. It is remarkable that such a treatment did not produce more harmful effects. It is generally conceded that the production of an erythema is not to be desired, and therefore Boggs' technique is not advocated at this day when we are able to have a measured dose with proper filtration and avoid skin effects altogether. Boggs reported 14 successfully treated cases in 1907, and three years later made an additional report in which his cosmetic results were far superior to surgical scars; and even where fistulæ were present or it was necessary to puncture abscessed glands, there were smooth

scars devoid of keloid formation so frequently observed after surgical treatment alone.

Dunham observed 13 cases of tubercular cervical adenitis in all of which roentgenoscopy revealed enlargement of the mediastinal glands. This seems to indicate that the radical removal of cervical glands can hardly offer any cure *per se*. Dunham favors mercurial injections and roentgentherapy to the affected glands, at the same time paying attention to the diet and hygiene, surgery being resorted to only in case of abscess formation.

Roques considers roentgentherapy the treatment of choice in tubercular lymph-glands, the only contraindications being high fever, progressive phlegmonous suppuration and intercurrent severe illness.

Philipowicz reports his experience with 25 cases and considers roentgentherapy most satisfactory. He reports no subjective inconveniences, but states that the fistulæ heal with flexible cicatrices, that the lymph-nodes subside completely or remain as small dense fibroid bodies. Under the age of ten he believes that the possible danger of interfering with growth processes is a contraindication to roentgentherapy.

Fritsch has applied roentgentherapy in 33 cases of tuberculous lymph-nodes in patients from seven to thirty years of age. These cases were seen during the last year and 8 of them are entirely cured and 8 much improved. Of the remaining cases, some are still undergoing treatment and some were lost sight of. He followed Kienböck's technique; found that accompanying tuberculous lesions elsewhere reduce the prospects of success; believes that roentgentherapy is liable to prove effectual without having a disfiguring scar or necessitating a general anesthetic; and that the treatment can be applied without interfering with the patient's occupation, but that a six months' course is usually necessary. Pirie believes that early cases are most suitable, but that tubercular glands can be successfully treated by roentgentherapy both before and after they have broken down. He reports a number of cases with accompanying photographs.

Iselin reports 206 cases of glandular tuberculosis treated with the Roentgen rays, and in which he achieved a complete cure in 133 and an improvement in all but 4 of the remainder.

Bone and Joint Tuberculosis.—Since Kirmisson in 1898 reported the first successful roentgentherapy of a carpal tuberculosis, there have been articles at intervals which included only one or two case reports. It would hardly be considered just to advocate a therapy upon such meagre reports, but lately there have been larger groups of cases reported out of certain Continental clinics. The most important reports are by Baisch, Freund, Iselin, and Schede.

Freund reports upon 71 cases of joint tuberculosis treated by the Roentgen ray. In 8 cases given mild roentgen exposures, 5 were cured and three showed no improvement. Out of 10 cases given intensive exposures only 2 were benefited. Freund observed certain phenomena which suggested that the tubercle bacilli in some towns are more resistant than in others, and this seemed to be the only explanation of the fact that the same treatment failed so frequently at Bonn, while it gave almost constantly good results at other places with the same technique and roentgenologist. A similar observation is noted by Oppenheim. Freund came to the conclusion that Roentgen rays were favorable therapy in all cases of tuberculosis of rib, phalanx, carpus, tarsus, scapula and sternum where there were

few overlying tissues and the synovia was not affected, and there was no pus condition. Freund's earlier report had 6 complete recoveries out of 10 cases, 2 improved and 2 without improvement.

Iselin in 1910 reported 41 cases, of which 24 were cured, 6 improved, 1 not improved, 10 still under treatment with a tendency toward cure, and 4 recurrences. Most of these cases were of the small bones of the hand and foot, and none of the larger joints because of the uncertainty of the influence of deep roentgentherapy upon growing epiphyses. While Iselin is not of the opinion that the roentgentherapy upon growing joints would be more harmful than surgical procedures, he does not think that they are warranted until better data are forthcoming upon this issue.

Iselin's roentgen technique has been favorably mentioned in many of the most recent articles upon this subject. He uses a modification of Kienbœck's *Expositivmethode*. Hard rays are filtered through 1 mm. of aluminum, and as much ray is used at one sitting as the skin can stand without damage, awaiting the dose effect and not raying the same place more than once in two or three weeks. The joints are rayed from four sides and Sabouraud's pastilles used to control skin effect. Instead of using Kienbœck's method of giving a double maximal dose through 1 mm. of aluminum with the control pastille unprotected near the tube, Iselin puts the pastille under an aluminum plate, the same thickness as is the filter in the stipulated position for pastilles near the tube, and then measures to the maximal dose. He has thus been able to give from two to five maximal doses without outward skin effect. Rarely more than three series of four-sided joint rayings are necessary. He follows the healing of the joints with hot air baths, massage and exercises. In his earlier report Iselin does not consider the roentgentherapy applicable in (1) deep-seated tuberculosis of the hip, shoulder and sacro-iliac joints, (2) tumor albus in adolescents, (3) in young children because of possible epiphyseal damage, (4) isolated foci where the superficial tissues are not affected. Iselin's first report gave 10 complete cures out of 24 joint cases, 5 improved, and the balance still under treatment. His later report states that 70 to 80 per cent. of his cases took on weight and at the same time showed recession of the tubercular process. A careful analysis of Iselin's first report, in which there are roentgenograms of tubercular bones before and after treatment, lends confidence to the feasibility of roentgentherapy in the smaller bones and superficial joints.

Judgment must be used in the selection of cases for this therapy, and the wise application of proved surgical measures together with the usual attention to diet and hygiene increases the probability of cure. Iselin, however, attempted to carry out his roentgentherapy without more than casual attention to diet and hygiene. If any comparison could be made between roentgentherapy and surgery as regards the economic and cosmetic results, the advantage would lie with roentgentherapy.

Oppenheim and Schede have reported upon roentgentherapy in joint and bone tuberculosis, incorporating extensive reviews of the literature with a few favorable case reports. Better results are reported in grown individuals. Schede has attempted larger joints and is enthusiastic over his results. He does not consider that the doses employed in this treatment have much effect upon a growing joint, at least his experiments failed to show any; and even if there should be any effect, the discrepancy could not be more than after

a surgical resection. Others have made this same observation which is contrary to the fears of Iselin and certain theoretical experiments upon the lower animals. Schede, while impressed with roentgentherapy, would still continue to follow indications for modern orthopedic and dietetic measures.

Pulmonary Tuberculosis.—Gibson has reported upon his use of the Roentgen ray in the treatment of pulmonary tuberculosis upon several occasions, but this article is reviewed because of the interesting discussion of the paper which was indulged in by a recognized authority in roentgenology (Pfahler, of Philadelphia).

Gibson claims to have used the Roentgen ray in 380 cases of tuberculosis pulmonalis. There are no statistics of the clinical findings or degree of pulmonary involvement in Gibson's articles, but he summarizes his results in a rather ambiguous manner when he says, "I find that in the cases that were treated for as long a period as two months or long enough for the treatment favorably to affect them, there have been only 44 deaths from all causes." He claims that 85 per cent. of the cases treated are still living, and that many of them were in the second and third stages.

Gibson believes that with the x -ray more chemic ether vibrations can be put through the lungs in ten minutes than can be had in months from ordinary sunshine, and he believes that the x -ray produces a hyperemia of the lungs. Together with this therapeutic agent Gibson does his work in the climate of Colorado where there are the maxima of natural advantages, and he also uses forced feeding, rest, or exercise, plenty of fresh air, with all the sunshine possible. Throughout his report Gibson exhibits an unusual confidence in this therapy.

Immediately after the presentation of this paper before the American Electrotherapeutic Association, Pfahler asked Gibson to relate how often he treated his patients; how much of a dose he gave at each treatment; how he estimated the dose; and in what direction the rays were applied. Gibson answered that he had been treating these cases for years before the measurement could be made by means of meters or radiometers, and that he found nothing that answered so well as his own observation of the color of the tube in accordance with his experience. He has lately been using a hot wire meter, and this registered from one to two milliamperes of current through an ordinary 7 in. tube. The treatment was given to the back one day and the next treatment from the front. Treatments were given every other day. The distance of the target of the tube from the patient was as a rule 14 in. He attempted to maintain a condition near to dermatitis, but avoided causing a dermatitis. Exposures were given three times a week for at least four months. He does not use any filters. He has never measured his doses by any of the accepted radiometers. Pfahler found a good deal of fault with this technique and felt that if he attempted to reproduce the treatment with the technique as outlined by Gibson he would burn his patients.

We cannot refrain from a criticism of such an article, as that of Gibson's, where he makes a report of a high percentage of cures in a disease which is generally recognized as being very desperate to handle therapeutically. Furthermore, there is absolutely no tabulation of the cases by means of which we might recognize the stage in which the case received the x -ray treatment, neither is there any

good description of his technique which might be followed by others in an attempt to parallel his phenomenal success as he reports it.

Kuepferle has made several reports of his experimental research with roentgentherapy upon animal tuberculosis. He reports that only large doses of hard Roentgen rays seem to be able to exert a favorable influence on the tubercular process. The action of the Roentgen ray may be effectually reenforced by other forms of radiant energy and other measures which resemble them in their action. In none of his experimental work was it possible to destroy entirely the tubercular process, not even in incipient cases. The tubercle bacilli themselves did not seem to be directly injured by the roentgen exposure; animals inoculated with them afterwards developed tuberculosis, but the fibrous transformation of the tuberculous tissue under the influence of the ray checked the growth of the tubercle bacilli in the focus and protected against their spread.

Kuepferle applied the Roentgen rays, in not too small doses of hard rays, upon 15 patients in the first and second stages of tuberculosis with hopeful results, and feels that the Roentgen rays may possibly be considered a valuable adjuvant in the medical treatment of tuberculosis. His report, however, does not carry with it any unwarranted confidence, such as we believe is present in Gibson's article.

In his experimental work upon rabbits, Kuepferle describes his technique with an exactness that is most satisfactory, and his pathological work in connection with this warrants our respect. His chief finding is that in lung tuberculosis after roentgentherapy there is noticed a decided tendency to the formation of connective-tissue and the encapsulation of the tuberculous foci. But in none of his experiments was he able to report that there had been any healing of the tuberculosis which could be attributed to roentgentherapy alone.

Tubercular Laryngitis.—Poyet reports 2 cases of dysphasia in the course of tubercular laryngitis, which were cured of the pain by roentgentherapy. Pancoast reports several cases of tuberculosis of the larynx which were cured by means of the Roentgen ray. In all the cases reported the results were obtained in a very short time; for instance, Wilms' case was completely well in three weeks. None of the reports indicates any large number of treatments or the extension of the treatment over several months, such as is necessary in the treatment of tuberculosis of bones and joints.

THE ROENTGEN RAY IN THE DIAGNOSIS AND TREATMENT OF TUBERCULOSIS IN CHILDREN.

A REVIEW OF RECENT LITERATURE.

By ALFRED FRIEDLANDER, M. D., of the Editorial Staff.

1. Reade and Caley: Value of X-Ray in Diagnosis of Tuberculosis in Children. (*Lancet*, November 30th, 1912.)
2. Morton: X-Ray in Chest Diseases. (*British Med. Journ.*, October 11th, 1913.)
3. Fonzo: Early Diagnosis of Tuberculosis by the X-Ray. (*Gazz. Internaz. di Med. Chir.*, p. 505, 1913; Abs. *British Journ. Dis. Children*, December, 1913.)
4. Lapage: X-Ray in Pulmonary Tuberculosis. (*British Med. Journ.*, p. 499, 1913.)
5. Lees: Diagnosis of Pulmonary Tuberculosis. (*British Journ. Dis. Children*, December, 1913.)
6. Variot: Radiology in Study of Disease in Infants. (*Ann. de Méd. et Chir. Inf.*, January 1st, 1913.)
7. Sluka: Hilus Tuberculosis in the Child. (*Wien. klin. Wochenschr.*, p. 254, 1913.)
8. Rach: X-Ray Diagnosis of Pulmonary Tuberculosis in Children. (*Zeitschr. fuer Kinderheilk.*, Vol. VII, No. 4.)
9. D'Oelsnitz and Paschetta: Radiologic Study of Tracheo-Bronchial Adenopathy. (*Arch. de Méd. des Enf.*, November, 1913.)
10. Woodruff: Radiographic Studies of the Chest in Tuberculous Meningitis. (*Arch. Pediatrics*, September, 1913.)
11. Iselin: Conservative Treatment of Glandular Tuberculosis. (*Cor.-Bl. fuer schweiz. Aerzte*, No. 20, 1912.)
12. Iselin: Treatment of Tuberculous Foci by the X-Ray. (*Deutsch. med. Wochenschr.*, Nos. 7 and 8, 1913.)
13. Jopson: Fallacies Regarding Treatment of Tuberculous Adenitis. (*Archiv. Pediatrics*, August, 1913.)

Reade and Caley examined a series of malnourished anemic children with headache, anorexia and positive von Pirquet reaction. They found hilus shadows constantly present, which were missing in chest pictures of normal children. In view of the absence of definite physical signs in the lungs in early tuberculosis in childhood, they believe that the *x*-ray find is of great value in diagnosis.

Morton emphasizes this latter point also. He believes that there is a definite group of cases (not limited to childhood) where the clinical signs and symptoms are so slight as to make a definite diagnosis out of the question. Yet in a large proportion of these cases, the *x*-ray will give a positive diagnosis and in many others will permit a tentative one. He believes that the ray is a valuable diagnostic adjunct.

Fonzo records 50 cases in children, aged from two months to ten years, and finds that (1) radioscopy of the thorax is of great value in controlling lesions found clinically; (2) radioscopy may reveal apical lesions which cannot be demonstrated clinically. In general, he is convinced that radioscopy is of great value in the early diagnosis of tuberculosis in childhood.

Lapage, in discussing the frequency of pulmonary tuberculosis in childhood, calls attention again to the fact that the primary lesion is often at the root of the lung. The conditions giving rise to special difficulty in diagnosis are (a) active open disease at the roots; (b) active disease limited to the bronchial glands; (c) healed disease in the lungs, with some superadded condition causing general symptoms resembling those of tuberculosis.

Examination by the *x*-ray is of great importance in the diagnosis of these conditions, and in early cases as supplementary to the clinical examination.

Bythell calls attention to the necessity for thorough examination of the roots of the lung in the plates. Streaky markings are not of as great importance as are shadows, due to enlarged bronchial glands. In the earliest stages of root disease, definite indication of the lesion may often be discovered by means of the ray when no physical signs are to be detected. On the other hand, Lees finds that the diagnosis of pulmonary tuberculosis is more difficult in children than in adults. X-ray examination of the lungs in children is subject to special difficulties, requires the highest expert method and interpretation, and is often not available. He holds that the diagnosis is therefore dependent upon accurate physical examination by percussion and auscultation. (This view is to-day not generally accepted.)

Discussing *x*-ray examinations in children, Variot points out that even in infants fluoroscopic examinations can be made with ease, while pictures can be taken without difficulty.

Sluka has found that the three-cornered shadow, with the base toward the heart and the apex toward the periphery, is apt to indicate a tuberculous root focus. In all, the author has now collected 38 cases. No such shadows were ever found in the first two years of life. (It is worth noting, however, that hilus infection undoubtedly occurs, even in the first year of life.) Rach reports 2 cases with the three-cornered shadow. On autopsy they were found to correspond to caseated foci near the hilus. He insists that Ghon's primary focus (at the hilus) can often be demonstrated radiographically when it can be shown by no other method. With negative physical findings, positive von Pirquet reaction, and a circumscribed shadow lying to the side of the hilus, the diagnosis is positive. The older the child, the more favorable the prognosis when this picture is found. After eight years of age, it generally denotes a stationary tuberculosis, and offers the most favorable explanation of a positive cutaneous test. Swelling and caseation of the paratracheal glands, on the right, are frequent, and are shown by a shadow extending outward from the median line, running parallel to the trachea for a space and then regaining the median line. Such a picture generally denotes a progressive tuberculosis involving the lymph-nodes.

D'Oelsnitz and Paschetta show that the diagnosis of enlarged tracheobronchial glands can be made without difficulty by the *x*-ray. They offer various detailed studies of the pictures presented by diverse stages of this affection, and enter into technical details as to

methods, position, etc. An interesting phase of their work concerns itself with the question of repeated examinations of the same subject. They are convinced that by means of the *x*-ray pictures, it is possible to follow the course of the affection and to note the evolution of the process with great exactitude. The results of special methods of treatment may thus also be studied.

Woodruff has studied 15 cases of tuberculous meningitis with reference to the chest findings as demonstrated by the *x*-ray. In all but one case the *x*-ray showed a tuberculous chest lesion. The author suggests that as there is usually considerable pulmonary involvement in tuberculous meningitis the *x*-ray may be of diagnostic aid. This would hold good particularly in those cases in which the diagnosis is not absolutely certain, owing to the failure to find the tubercle bacilli in the spinal fluid, and in which the strongly corroborative testimony of a positive von Pirquet reaction is lacking.

Treatment.—Iselin reports 202 cases of glandular tuberculosis treated with the *x*-ray (adults and children). Of 99 cases without fistula, 63 were completely cured; 35 improved. Only 1 patient showed no improvement. Of 43 cases with fistula, 29 were cured, 14 improved.

The rest of the cases showed some complicating lesion in addition to the glandular tuberculosis. Many of these showed great improvement. The main point according to Iselin is the careful regulation of the individual dose of the ray given. Different parts of the body differ greatly as to their resistance, and skin lesions are more common in the legs, for instance, than in some other regions. Iselin notes that in Basel in the past three years the surgical treatment of glandular tuberculosis has been superseded in large measure by the *x*-ray treatment. In a subsequent communication, Iselin calls attention to the gain in weight usually observed after proper *x*-ray treatment of tuberculous foci. This gain in weight and the local improvement of the focus are expressions of the healing effects of the ray. There are two methods of procedure open: (1) To attempt the detoxication of the focus, and (2) to aid resorption through repeated weak irradiations, this being the procedure of choice in mild cases. In severe cases, there should be intense penetrating exposures, in order to cause damage to the vessels in the tuberculous foci and thus bring about sclerosis and encapsulation.

Jopson takes rather strong ground against the *x*-ray treatment of tuberculous adenitis. He says that even the most optimistic among the advocates of the *x*-ray mention twelve to twenty treatments in a course extending over three months. When failure to cure by the *x*-ray does not occur, the subsequent removal of glands is exceedingly difficult on account of the density of the periglandular adhesions. He quotes Pancoast as saying that the ray has no direct bactericidal action on the tubercle bacillus. The action is an indirect one, stimulating the surrounding tissue cells and increasing their nutrition to enable them to resist or destroy the active pathological factors. Jopson even objects to *x*-ray treatment after operation to prevent recurrence, on account of the possible danger of the *x*-ray to the metabolism, especially of the growing child.

HYSTERECTOMY AS A THERAPEUTIC MEASURE IN PREGNANT WOMEN SUFFERING FROM TUBERCULOSIS.

A REVIEW OF RECENT LITERATURE.

By HUGO EHRENFEST, M. D., of the Editorial Staff.

1. Bardeleben (*Zentralbl. fuer Gynæk.*, Vol. 35, p. 1085, July 29th, 1911; *Muench. med. Wochenschr.*, Vol. 59, p. 1540, July 9th, 1912.)
2. Cristofoletti and Thaler (*Zentralbl. fuer Gynæk.*, Vol. 35, p. 958, July 8th, 1911).
3. Fehling (*Zeitschr. fuer aerztl. Fortbildung.*, Abs. *Zentralbl. fuer Gynæk.*, Vol. 36, p. 877, June 26th, 1912).
4. Ferroni (*Monatschr. fuer Geburtsh. und Gynæk.*, Vol. 37, p. 274, February, 1913).
5. Heil (*Zentralbl. fuer Gynæk.*, Vol. 35, p. 1523, November 4th, 1911).
6. Henkel (*Archiv fuer Gynæk.*, Vol. 94, p. 580).
7. Hirt (*Muench. med. Wochenschr.*, Vol. 60, p. 1745, August 5th, 1913).
8. Kroemer (*Frauenarzt*, 1911; Abs. *Zentralbl. fuer Gynæk.*, Vol. 36, p. 288, March 2nd, 1912).
9. Lobenstine (*Amer. Journ. Obstet.*, Vol. 67, p. 363, February, 1913).
10. Martin (*Muench. med. Wochenschr.*, Vol. 56, p. 1228, June 15th, 1909).
11. Pankow: *Die Schwangerschaftsunterbrechung bei Lungen und Kehlkopftuberkulose*. Leipzig, Georg Thieme. 1911.
12. Schlimpert (*Archiv fuer Gynæk.*, Vol. 94, p. 863).
13. Transactions of the Society of Obstetrics and Gynecology in Berlin. (*Zeitschr. fuer Geburtsh. und Gynæk.*, Vol. 68, pp. 521, 753.)

A very clear conception of the marked change of views regarding the effect of pregnancy on a coexisting tuberculous process can be gained by a comparison of opinions as expressed at the International Congress of Obstetrics and Gynecology held in Rome in 1902, and approximately ten years later at the 14th Congress of the German Society of Obstetrics and Gynecology, in 1911, or at the meeting of the Society of Obstetrics and Gynecology of Berlin in January, 1911, and the meeting of German Naturalists and Physicians in 1912. The transition of a rather pronounced conservatism in 1902 to striking radicalism in 1912 is evident. Indeed, it was the Congress at Rome which furnished the impetus for a thorough statistical study of the problem in various German clinics, and the results of these studies have convincingly shown that pregnancy exerts a more deleterious effect on an intercurrent tuberculous process than had heretofore been assumed. The opinion that in every

instance of positively established tuberculosis, a pregnancy should be interrupted, as early as possible, rapidly gained in favor. The next logical step was taken, and permanent or only temporary sterilization by means of a tubal operation, simultaneously with or soon after artificial abortion, was adopted almost as a routine procedure, at least for a certain group of cases. A further study of patients treated in this manner, however, revealed that the results, while better than before, still were far from satisfactory. The immediate mortality after operative interference seemed too high. The loss of blood incident to operation and definite dangers of the puerperium were advanced as causes for this mortality. Late results also did not prove a very striking advantage of artificial interruption of pregnancy. Some of these patients after abortion developed a more general or even miliary tuberculosis. An acceptable explanation of this clinical observation was furnished by histological study of the placenta and of the area of its attachment, which demonstrated the presence of tubercle bacilli in these tissues rather as the rule than the exception. All theoretical considerations have gradually been placed on a rather concrete basis by the statistics of Bardeleben, Pankow, and others, and by extensive post-mortem and histological investigations as carried out especially by Schlimpert.

Bumm was probably the first who attempted to eliminate all the immediate and later shortcomings of artificial abortion with tubal sterilization by the removal of the pregnant uterus as a whole. The rationale of this procedure is set forth by his assistant E. Martin in a paper published in 1909.

The positive proof of the distinct harmful effect of a pregnancy on a tuberculous process furnishes the indication for interruption of the pregnancy. This fact, together with the unusual fertility so frequently observed among tuberculous women, makes the desirability or necessity of the prevention of further pregnancies evident. All mechanical means of prevention are unreliable and, therefore, operative procedures for this purpose are necessary. But even the simultaneous emptying of the uterus with tubal sterilization, usually done in one sitting under lumbar anesthesia, still leaves to the operated woman the necessity of passing through a puerperium, which is not free from a definite danger. This consideration induced Bumm to resort to the vaginal extirpation of the pregnant uterus as the most appropriate mode of procedure. He decided to add the removal of both ovaries, because most women will grow stouter after castration, and this effect seemed particularly desirable in tuberculous patients. A vaginal total hysterectomy under lumbar anesthesia can be performed without great danger to the patient and certainly with less loss of blood than an artificial abortion with simultaneous vaginal tubal sterilization.

Two years later, in 1911, Martin reported, at the meeting of the Society of German Gynecologists, concerning 26 total hysterectomies done on pregnant tuberculous women in Bumm's clinic in Berlin. Both the immediate and late results seemed entirely satisfactory. He again emphasized the three chief advantages: less loss of blood, the elimination of a puerperium, and an increase in the adipose tissue. Martin concedes the difficulty of determining exactly the indications for such heroic interference. It is justifiable only in married women, mothers of several grown up and healthy chil-

dren, positively afflicted with a progressive tuberculous infection, in whom the process has not advanced to a hopeless stage.

Practically identical views are expressed by Fehling. He believes that whenever another pregnancy seems contraindicated the best method of treatment is a total vaginal hysterectomy. A further loss of blood through menstruation is prevented, and the possible advantage of a climacteric adipositas is secured.

A vaginal operation is suggested because most authors agree that good late results can be expected only if the pregnancy is terminated within the first four months, for which cases the vaginal route seems more feasible. This fact is brought out by Hirt and also by Thorn, who in discussing Hirt's paper, states that this operation is justifiable in elderly women who have a sufficient number of children. Artificial abortion with tubal sterilization is undeniably an operation which will cause the loss of a greater amount of blood.

Some writers give distinct preference to the vaginal operation, others prefer the abdominal route after the fourth month, while still a third group favors the typical abdominal hysterectomy.

In an interesting article, entitled "Is Abdominal Total Hysterectomy for Cases of Pulmonary Tuberculosis ever Justifiable?" Henkel, after a thorough consideration of the various aspects of this problem, answers this question in the affirmative. It is his belief that in all cases of tuberculosis early interruption without exception is indicated, combined with tubal sterilization if there is no hope for a complete cure of the tuberculosis. But in the more advanced cases better results can be obtained only if the loss of blood incident to the removal of the ovum is reduced to a minimum and all possible complications of the puerperium are excluded. This can be achieved best by hysterectomy. Independent of the duration of pregnancy he considers the abdominal route preferable, the operation being done under spinal anesthesia. He lays particular stress on the removal of both ovaries. Castration, as has been shown in osteomalacia, favors the deposition of calcium salts; and tuberculous pulmonary lesions, whenever found completely healed, usually contain these salts. Therefore, the radical operation probably will also exert a beneficial curative effect upon the tuberculous process itself.

Ferroni reports three total abdominal extirpations, and adds that he does not feel ready to pass final judgment on the possible advantage of such procedure.

In 1909 Riek described a supravaginal amputation of the uterus performed through the vagina. A very similar operation has been performed by Krømer on pregnant tuberculous women. He considers the method preferable to the total extirpation, because a better vaginal vault is obtained when the preserved cervical stump is sewed into the anterior vaginal incision in the form of a vaginofixation. He also leaves tubes and ovaries, and claims that this operation can be easily done on an uterus even five months pregnant. Jaschke thinks that this type of vaginal corpus amputation should be the operation of choice and the abdominal hysterectomy only the exception.

There exists still another type of a vaginal operation described and first performed by Bardeleben. He was also impressed by the evident fact that the simple artificial abortion did not yield satisfactory results. Too many of the patients showed, soon after the operation, a decided aggravation of the tuberculous

process, and it is his opinion that this is directly due to anomalies of the puerperium. In many other cases the general condition was later greatly impaired by menorrhagia, metrorrhagia, or dysmenorrhea. These considerations induced him to resort to hysterectomy and corpus amputation, when again he became dissatisfied through the frequency of more or less pronounced molimina due to the artificial menopause. Thus he finally evolved an operation, known as corpus excision, consisting in the removal only of the fundus of the uterus but always including the entire area of placental attachment. Up to the fourth month of pregnancy it is performed through the vagina, later by the abdominal route. This operation secures the interruption of pregnancy, the removal of the dangerous placental area, but preserves menstrual function without any likelihood of the development of menorrhagia or metrorrhagia. He did his first operation in 1908, and at the time of his report in 1911 had performed it on 22 patients without mortality and apparently with satisfactory end results. In a report published one year later, the number of patients operated in this manner had increased to 48 (40 vaginal and 8 abdominal operations) still without mortality.

At meetings in January and February, 1911, of the Society of Obstetrics and Gynecology in Berlin, Bardeleben presented his proposition of a partial corpus excision in a general discussion of the tuberculosis problem. Martin confessed that he could not quite grasp what Bardeleben was contemplating. Heinsius asserted that to him vaginal hysterectomy with preservation of the ovaries represents the operation of choice. Fleischlen refused to consider Bardeleben's operation because he did not feel that a pulmonary tuberculosis could ever be accepted as an indication for the removal of the pregnant uterus. In his opinion, the assumption of the untoward effect of the puerperal state is solely a theoretical one, at present. Bokelman, the next speaker, agreed, in general, with Fleischlen, and called corpus excision an 'operative artificiality.' Rather ironically he added that those who seem to have such a horror of the puerperal state may possibly go a step farther and insist on the removal also of the breasts. Bumm advanced the arguments already quoted in favor of his radical procedure of removal of the uterus and ovaries. Strassmann thought that even the simultaneous sterilization should be considered only in exceptional cases; therefore, the removal of the uterus could be justifiable only very rarely, in which case the ovaries should be preserved. Schaeffer also objected to Bardeleben's operation, feeling sure that Bardeleben is unnecessarily afraid of the effect of the puerperium. Hammerschlag very appropriately called attention to the fact that one cannot very well speak of a typical puerperium if pregnancy is artificially interrupted, as generally suggested, within the first four months of pregnancy. Franz was not convinced that any of the more heroic operations—removal of the entire or of part of the uterus—actually yielded better results.

In justice to Bardeleben it may be stated, as emphasized by the presiding officer, that the author had hardly enough time to present his arguments clearly or in detail. This fact, together with a certain misunderstanding that Bardeleben intends to see his operation applied to all cases of pregnancy and tuberculosis, will account for the rather unfavorable attitude taken by most of the speakers in this very interesting and instructive discussion.

Corpus excision, at least in the hands of its originator, has proved a safe operation and has been adopted by other operators. Its logical place in the operative therapy of pregnancy, complicated by tuberculosis, has been set forth very recently by Lobenstine. The permanent results with artificial abortion are so decidedly unsatisfactory, because a tuberculous process in the placenta and decidua basalis is more common than has hitherto ever been suspected. Upon separation of the placenta the intervillous spaces, the favored resting places of the bacilli, are traumatized and the germs cast into adjacent tissues or into the system at large. Thus in severe cases a vicious circle is established. The removal of the area of placental attachment will eliminate the uterine portion of this circle. It may be stated that in discussing Lobenstine's paper, Boldt asserted that sterilization may seem justifiable in some cases, but never removal of the uterus. The remarks made on this occasion by Knopf, the well-known authority on tuberculosis, seem noteworthy. When after careful counsel with one, or, better, two competent consultants for internal diseases and an experienced obstetrician, the diagnosis of pregnancy and tuberculosis is certain, the careful and aseptic emptying of the uterus by an expert is virtually free of danger. "It goes without saying that in the majority of these cases the ligation of the tubes, at the same time or soon after, is indicated."

It is interesting to note the difference of opinion among the various advocates of radical procedures as to the desirability of removing or preserving the ovaries. Bumm removes them to obtain a rapid increase in adipose tissue, and Henkel for the purpose of favoring the deposit of calcium salts in the tuberculous lung tissue. Krømer strenuously objects to such practice, because in tuberculous patients rapid aggravation of the pulmonary process has repeatedly been recorded when both ovaries had been removed for tumors, and secondly, because in many patients the symptoms of the artificial menopause greatly add to their sufferings. Pankow who furnished very important statistical material for the study of this problem is against extirpation of the uterus or removal of the ovaries. Heil made five vaginal hysterectomies and considers this operation decidedly superior either to vaginal corpus amputation or corpus excision. He insists on the preservation of the ovaries to avoid climacteric molimina, and feels sure that an increase in adipositas may just as well be procured by a proper dietetic regime. Bardeleben, as already mentioned, devised his own operation for the express purpose of preserving menstrual function. A very interesting light is thrown on this particular question by the experiments of Cristofolletti and Thaler, who have apparently proved that castrated animals show a lowered resistance against an infection with tuberculosis.

Sufficient time has not elapsed to draw, from the present results, any conclusive deductions concerning the definite value of these more radical methods of dealing with a pregnancy complicated with an active tuberculosis. While, in general, very careful and critical investigations have undoubtedly forced the conclusion that in the overwhelming majority of instances a tuberculous patient is seriously handicapped by an intercurrent pregnancy, the individual observer always meets with the occasional case in which no untoward effect can be ascertained. It is this fact which prevents

the discriminating physician from adopting artificial abortion as a routine procedure; it is this fact which will render almost impossible the task of determining in the individual case the necessity of extirpating a pregnant uterus in an attempt, not only to arrest a tuberculous condition, but to improve the patient's chances of life—this, indeed, is the actual aim of total or partial removal of the pregnant uterus in tuberculous women.

DIAGNOSTIC AND THERAPEUTIC NOTES.

By ALBERT E. TAUSSIG, M. D., of St. Louis.

BIOT'S STAIN FOR TUBERCLE BACILLI.—Arloing and Biot (*Lyon méd.*, December 14th, 1913). Biot's stain, while somewhat more complex than those ordinarily used, gives preparations of such brilliancy and uniformity that it is well worth the extra pains. The technique is as follows:—

1. A very thin spread of sputum is made. This is indispensable. It is fixed as usual.
2. Stain with warm carbol-fuchsin for two or three minutes.
3. Without washing, decolorize thoroughly first in 25 per cent. nitric acid, then in absolute alcohol.
4. Wash with water; then place in ordinary, concentrated formol for at least three minutes.
5. Wash, dry, examine.

The bacilli, colored a dark violet, stand out clearly against the unstained background. The detail of their structure comes out well, and the granules of Much, which ordinarily escape detection, take on the same stain as the bacilli themselves and are clearly seen to be of the same nature. The method is especially suitable for sputa or other secretions in which the ordinary methods give negative results but in which the presence of the etiological agent is nevertheless suspected. It compares favorably with the much more tedious methods of Much, Spengler and Fontes.

THE SURGICAL TREATMENT OF TUBERCULOUS PLEURITIC EXUDATES.—Spengler and Sauerbruch (*Muench. med. Wochenschr.*, No. 51, 1913). It has long been noted that the occurrence of a pleuritic exudate is followed by a marked improvement in the underlying tuberculous process. This is only in part due to the mechanical compression of the diseased lung; in part, the absorption of certain elements of the pleuritic fluid appears to lead to the increased production of immune bodies. The treatment of such exudates depends primarily upon the condition of the lung. If the pulmonary tuberculosis is incipient and localized in one apex or one hilus, and if the amount of fluid is not excessive, it is best to leave the exudate alone. In all cases of advanced tuberculosis, however, especially those in themselves suitable for artificial pneumothorax, the fluid should be partially evacuated and replaced by injected nitrogen gas. The resulting absorption of fluid leads to favorable serological changes, while the mechanical benefits of compression are conserved. The same treatment is indicated even in early tuberculosis, if the fluid shows no tendency to absorption. The formation of extensive adhesions is thus prevented.

If the fluid becomes infected, so that an empyema results, all

radical procedures, such as resection of a rib, only make matters worse and usually end in the death of the patient. In such cases, pleural lavage, according to Forlanini's method, is much to be preferred. The purulent exudate is aspirated through a needle and the pleural cavity washed with 2-4 litres of a $\frac{1}{2}$ -1 pro-mille (1/20-1/10 per cent.) solution of lysoform. Most of these cases of pyopneumothorax heal when so treated. If, however, the pyopneumothorax results from the perforation of a tuberculous cavity into the pleural space, the prognosis is much more grave. Formerly, nearly all these cases succumbed. Better results have been obtained with Spengler's treatment. This consists essentially in aspirating the pus and in so collapsing that half of the thorax that no further accumulation of pus is possible. A day or two after the aspiration of the exudate, an extensive thoracoplasty of the lower half of the thorax is done. Two or three weeks later a similar operation is done on the upper thorax and sometimes a third sitting is necessary. The resulting collapse of that half of the thorax leads, in favorable cases, to an obliteration and healing of both the empyematous and the original tuberculous cavities.

This article, by two of the world's greatest phthisiotherapists, deserves careful reading by all who are interested in the surgical treatment of pulmonary tuberculosis.

A SIMPLE METHOD OF APPLYING THE VON PIRQUET TEST.—Shalet (*Journ. Amer. Med. Assoc.*, July 5th, 1913). After cleansing the flexor surface of the forearm in the usual manner, the flat end of a sterile toothpick is dipped into the tuberculin, is next gently pressed on the desired spot on the skin, and, while held in the middle by the thumb and index finger, a few turns (two to and fro turns, or four in all, to be exact) are made by rolling the toothpick on its own axis between the fingers. The result will be a very neat round abrasion of the epithelium without the appearance of blood. The same procedure is gone through with the control abrasion, another toothpick being used, of course.

The advantages of this method of application are many. It is simple. It eliminates the medicine dropper or tiny wooden spatula with which to apply the tuberculin. The test could be done in a sterile manner to a number of children in a short time, such as obtains in a busy children's clinic. It does not unduly frighten the over-apprehensive child with the exhibition of bright metal instruments, such as the von Pirquet borer or even a needle. Lastly it is done so quickly as to be decidedly less painful to the patient.

TUBERCULOSIS OF CERVICAL LYMPH-NODES.—Pybus (*Clinical Journal*, September 11th, 1913). The cause of tuberculosis of the nodes in the neck is largely due to milk from tuberculous cows, which causes tuberculosis of the tonsils, and from which the cervical nodes are infected. The tonsils may not be enlarged at all; indeed, frequently, if not usually, are not. They are apt to be small and buried, thus escaping discovery. In all cases the teeth must first be put in the best possible condition, and then the tonsils should be completely enucleated. If, after a reasonable time, the nodes do not disappear, they should be completely excised. It should be remembered, moreover, that simply opening and draining a subcutaneous abscess will not serve to cure the caseating nodes which

are sure to lie beneath. The radical operation is difficult and requires great skill to perform, but the results, although failures are not unknown, more than justify it. One must not lose sight of the fact, also, that there may be other tuberculous lesions associated with the disease in the neck.

THE EXAMINATION OF TUBERCULOUS PLEURAL FLUIDS.—Gloyne (*Lancet*, November 29th, 1913). In the author's series of cases tubercle bacilli were found in 40 per cent. of the serous, and 71.43 per cent. of the purulent fluids. Ordinary film preparations are satisfactory in purulent fluids, but in serous fluids more careful measures are often necessary. In large effusions, without clot, sedimentation and centrifugation of the fluid may be sufficient. When present, the examination of the clot offers the best hope of finding bacilli. In serous effusions the next best test is the lymphocyte count. Failing this, the tests in order of value are protein content (usually 4-5 per cent.) and specific gravity (about 1018). Sterility on ordinary culture media is suggestive of tubercle in purulent fluids. It is not of much value in serous exudates, since some other effusions and most transudates are also sterile. Secondary infection was noted by the author only in one instance.

TUBERCULIN TREATMENT OF BRONCHIAL ASTHMA.—Frankfurter (*Wien. klin. Wochenschr.*, No. 24, 1913). At autopsy, practically all cases of bronchial asthma show evidence of tuberculosis so that it is not unlikely that the latter may be, in some way, responsible for the attacks. The usual hygienic and diatetic treatment having proved unavailing, the writer tried tuberculin injections using that of Béraneck. In the 6 cases so treated, the results were most satisfactory. On the basis of his observations, he comes to the following conclusions:—

1. A causal relationship unquestionably exists between bronchial asthma and tuberculosis.
 2. A systematic course of tuberculin injections, carried on for a sufficient period of time, will lead to an amelioration and often to a cessation of the asthmatic attacks.
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RECALCIFICATION AND TUBERCULOSIS.—Fisac (*Arch. gén. de méd.*, No. 5, 1913). The writer has noticed that individuals who have much to do with lime, show an apparent immunity to tuberculosis. He therefore had his patients inhale lime-dust. The result was surprisingly good, even extensive cavities healing with the formation of scar tissue.

CAMPOR AS AN ANTIPYRETIC IN PULMONARY TUBERCULOSIS.—Weihrach (*Berl. klin. Wochenschr.*, No. 48, 1913). Given subcutaneously or endermically, camphor will control the fever in about 20 per cent. of all febrile cases of pulmonary tuberculosis. Not infrequently it will definitely improve the condition in other respects. Its mode of action is not quite clear. In all probability, it inhibits to a certain extent the growth of the pyogenic micro-organisms, and it may be that it exerts an anticatarrhal action upon the mucous membranes. It is perfectly harmless.

CORRESPONDENCE

LONDON LETTER.

THE STATE AND TUBERCULOSIS IN ENGLAND.

By F. G. CROOKSHANK, M. D. Lond., M. R. C. P.

It may be appropriate, and of topical interest, if, in the London Letter for this month's issue of the JOURNAL, some sketch, though perforce inadequate, is given of the State machinery actually in working order, or about to become operative in England in aid of what we call the Fight Against Tuberculosis. In the past we have boasted, not merely the resources provided by the Poor-Law, by way of infirmaries for the reception of cases of chronic pulmonary tuberculosis falling within the scope of its operations, but, in addition to the means provided by our greater and lesser general Hospitals for the early detection of the disease, the many fine institutions, of which the Brompton Hospital may be taken as the archetype, wherein special accommodation has been arranged, and special ability has been devoted, to the reception and treatment of cases of consumption. Moreover, these special Hospitals have, one and all, made use of auxiliary institutions, such as seaside and other convalescent homes, for carrying on the good work. But then, all these excellent institutions, other than the Poor-law infirmaries, were organized on a purely voluntary basis; and each represented a single fighting unit, linked up, by only the slenderest of ties, with other agencies.

The patients were considered purely as individuals; and it was individual necessity or distress that it was attempted to alleviate. Some twenty or more years ago, however, public opinion began to form; and the importance of tuberculosis, in relation to the life of the nation, was recognized, not only from the point of view of the aggregate of individual illness involved; not only in respect of the economic problems depending on so much illness; but because many became profoundly alive to the fact that tuberculosis was an infective disorder and that, in its consideration, many problems of medical as well as of sociological import must of necessity be adequately discussed. A society known as the National Association for the Prevention of Tuberculosis was formed under august auspices; and at once set to work to collate information, to enquire into remedies, and to propagate plans for amelioration. At this time, although perhaps many medical men had then an even sounder clinical knowledge of phthisis than have many alleged tuberculosis experts nowadays, much was believed and spoken of that would now be deemed sad stuff; and there were not lacking many who thought that, if the

practice of spitting were abolished, phthisis would disappear from amongst us.

At this time, too, although the organization of our public health services was less perfect than it now is, yet were we pretty keen on defence against infectious diseases generally; and one of the most useful achievements of the Association—still active and flourishing, with Dr. T. T. Peekins as its able Secretary—was this, that it familiarized the greater public with the notion that since the State could usefully, through local authorities, deal with diseases threatening the health of the community by reason of their means of spread, something of concerted action might, should, and ought to be attempted by the State in the way of dealing with tuberculosis. Before, however, any Government took any very definite action (other than by way of encouraging, rather tepidly, the care of the milk-supply, and the improvement of the housing of the working classes) the idea of sanatoria fell rather suddenly upon us. Great stories were brought over from Germany of what could be done by over-feeding in open-air institutions; and attention became rapidly focused on the need for the provision of such places for treatment of cases of phthisis. Sanatoria were built, or projected in many places, as a result of individual effort, and without State aid; certainly though here and there fostered by strenuous effort on the part of Mr. Garland and others, some cooperative attempt was made on the part of the workers to provide sanatoria for themselves. Still, on the whole, at this date, the modern treatment and care of tuberculosis was either something to be paid for, or to be got by the acceptance of charity.

The first defined step taken by the State by way of recognizing responsibility in this matter of tuberculosis, dates from the issue, by the Local Government Board (the central authority in most such matters) of what is known as the Public Health (Tuberculosis) Regulations 1908. By virtue of these Regulations the notification to local sanitary authorities of cases of tuberculosis coming within the cognizance of the Poor-Law officers was required in the same way as the notification of certain scheduled infectious diseases has been for long required from all medical practitioners, and from other persons. Prior to this date, local sanitary authorities (or rather the Medical Officer of Health responsible in each district to these authorities) had only become cognizant of such cases of tuberculosis accidentally; or by means of an irregular procedure in force in some districts, and known as voluntary notification. Voluntary notification was resorted to in a district for which I was then Medical Officer of Health some ten years ago, but, as has been said, the procedure was perhaps not technically strictly defensible. Still, no one cared to protest against payment being made for these notifications. In 1911, the principle of notification having gradually gained support, further regulations were issued requiring notification of all hospital and of some other cases, and now since December, 1912, regulations (known as those of 1912) have been in force, enjoining the notification of all cases of non-pulmonary as well as of pulmonary tuberculosis.

It has been laid down that notification is to be made on the strength of evidence other than derived solely from tuberculin tests, so that, speaking generally, every case of tuberculosis, once fairly diagnosed on clinical grounds (supported or not by laboratory tests, as they are called) should not escape the cognizance of cer-

tain defined local authorities. The time is not yet ripe for deciding how far this end is being attained, but responsibility is definitely attached to the local authorities, in this matter, by the central executive of the country.

But the Local Government Board has proceeded farther still. It having been laid down, by what is known as a General Order, that tuberculosis is an endemic and an infectious disease, the new tuberculosis regulations have been made to include certain provisions for the treatment of persons affected with tuberculosis and for preventing the spread of the disease.

Tuberculosis is, therefore, from the point of view of our local authorities, on a footing with scarlet fever and with smallpox. In various official documents schemes have been set out for the organization of appropriate measures, and it may be said that these schemes follow generally the recommendations made by a Departmental Committee, presided over by Mr. Waldorf Astor and published a year or two ago. These recommendations involve the organization in suitable areas of what are called 'dispensary units' and 'sanatorium units.'

Now the dispensary unit—a conception which we owe to Sir Robert Philip—consists of a dispensary; and, acting in conjunction with the private practitioners of a district, deals with patients resident in their own homes; provides for the diagnosis of cases suspected to be tuberculous; makes recommendation for appropriate treatment, and actually supplies such treatment for those cases as can be treated in connection with the dispensary.

The sanatorium unit, on the other hand, comprises the various classes of institutions available for tuberculous persons who need residential treatment.

Now what is supposed to happen is this, that while it is the duty of every Medical Officer of Health to advise his Authority in all sanitary matters (including the combat against tuberculosis), in actual practice, it is the larger, or County, or County Borough authorities who are to frame schemes and organize units, or series of units for this special purpose; so that special Tuberculosis Officers are to be appointed, to these larger districts, working with and under the Medical Officers of Health for their respective areas, and co-ordinating, in this respect, the work of the local Medical Officers of Health for the smaller constituent areas, on whom the task of controlling the work of notification, visitation, disinfection and so forth naturally falls.

All this is very schematic and excellent. Now, however, comes a fresh point. Hitherto, be it observed, we have been dealing with all persons, men, women and children. But the National Insurance Act of 1911 (Mr. Lloyd George's Act) introduces another complication. Special provisions of this Act contemplate the provision of treatment, on an extended scale, for all *insured* persons suffering from tuberculosis.

The Local Government Board's Regulations, be it noted, are, in certain respects permissive only, that is to say, in any district the rate-payers can only get such treatment for tuberculosis as their local authority may choose to devise, with the assent of the Central Executive. But those who are insured—that is to say, certain classes of workers, are entitled to what is called 'sanatorium benefit,' if recommended for it; and it is the duty of Local Insurance

Committees to see that this sanatorium benefit is rendered available for all of them.

Obviously, in order that overlapping be prevented, much care is needed, and much official paper has been, and is being covered with printer's ink, in the prosecution of negotiations that will bring into harmony the Insurance Committees that provide sanatorium benefit for those workers who *must* have it; and the Local Sanitary Authorities that *may* provide, not alone sanatorium, but other treatment and care for any person, insured or otherwise.

And very great progress is being made. Joint Committees are being everywhere formed; many tuberculosis officers have been appointed. Dispensary units are everywhere being organized; and the provision of sanatoria is being eagerly advanced. But here comes a difficulty, that of expense.

Co-operation bids fair to render the provision of sanatoria as economical as possible; and County Councils are uniting for such purpose. Funds of various nature, such as King Edward's Memorial Fund for Wales, and others have been put under levy; subscription lists have been opened and filled; and charitable gifts have been made. Moreover, the ingenious plan has been adopted of utilizing certain fever hospitals, or portions of fever hospitals (in districts possibly furnished in excess of their normal requirements) for the treatment of tuberculosis. The problem of sanatorium provision for London, is, however, one of stupendous magnitude and is occupying, and has been occupying, the official mind for some time; to what purpose will presently be seen.

It will be judged, I hope, from this necessarily superficial sketch, that we have for an effete country advanced really pretty considerably. A good deal that we are doing is quite illogical in method; but that is our way. All parties are loyally working together, and paid officers as well as unpaid committee-men are giving their best services to the practical working out of schemes and details. It will be a year or two at least before all things are in working order; it will be longer perhaps before divergencies of local practice have been harmonized; and it may—who knows?—be even longer, before we are sure of our ultimate results.

But, in spite of an occasional creaking of the wheels, an occasional jolt in the ruts, the gloom of foggy pessimists and the wails of despairing party politicians, it may be said that the great group schemes that are connected with the names of certain politicians, and yet are really the product of the work and brains of permanent officials of the type of Newsholme and Newman, is already under way.

Again, what the future will show us, who can say? "Eppur si muove!"

PARIS LETTER.

THE PROBLEM OF ALIMENTATION IN TUBERCULOSIS.

By AUGUSTE A. HOUSQUAINS, M. D.

Until recently, the regimen in tuberculosis was entirely a matter of over-feeding. To place the organism in a condition of defense against the invasion of the Koch bacillus and its toxin, there appeared to be no better method than to supply it with an excess of alimentary substances. However, this systematic over-feeding, given indiscriminately in the diverse forms of the disease, frequently produced bad results. Besides disgust for food and loss of appetite, there were gastric disturbances which were often febrile, gastro-intestinal complications causing symptoms of digestive toxemia,—an additional poison to the one resulting from the tuberculosis toxemia. The question of over-feeding has thus come in for a closer scrutiny; and recent investigations having shown all the bad and dangerous points in this procedure, a notable modification of ideas relative to the regimen of the tuberculous has ensued.

In fact, we know at present that one of the strongest factors against the invasion of tuberculosis is the liver, the antitoxic function of which has been illuminatingly set forth in the investigations of Professor Roger. The liver, be it said here, is the organ that opposes the toxins introduced into the organism. And this opposition is effected thanks to the lipoid substances manufactured in the hepatic cells. Professor Chauffard has shown the increase of cholesterin in the blood after dothienenteria, thus showing the processes of organic defense, the object of which is the combating of the action of toxins.

These experiments led to the idea as to what should be the two principal indications in the regimen of the tuberculous. In the first place, it was necessary to take into consideration the function of the liver, and prevent the lowering of its activity so that there would be no weakening of its antitoxic power as a result of interference in the formation of cholesterin. In the second place, the greatest possible quantity of lipoids should be introduced into the organism so as to increase the hepatic function and strengthen it.

The experiments of Grigant have demonstrated beyond a doubt that a lipoid regimen increases the amount of cholesterin in the blood; hence, the regimen for the tuberculous should be based on these two indications. In the majority of the cases of tuberculosis alcohol is the prime factor in the development of the disease, and we all know to what extent the liver is affected by it. Therefore, it is of the greatest importance to preserve from all danger an organ that is none too healthy, in fact in which lesions may already be present. The old ideas of over-feeding were far removed from reckoning with this danger, for by causing alimentary toxemia over-feeding very often reacted unfavorably on the liver. Again,

the nature of the food-stuffs was not thought of much moment, and preference was shown for certain foods which to-day have been proved to be of little utility.

An exact analysis of the therapeutic effects of different aliments, and especially the investigations instituted by Professor Lemoine, of Lille, have established a more rational regimen. According to these investigations, the diet should include substances rich in fat and as easy as possible of digestion. Of the aliments that contain a great amount of fat, mention should be made of brains and sweetbreads, and these should stand first in the diet for the tuberculous. The same can be said of eggs, the reputation of which as an important dietary factor is well known. But in advocating their use one should not go the lengths that have characterized the advice of some physicians, who give their patients daily what is really a fantastic number, since it is a fact that not only constipation but gastric disturbances will result.

As to meat, of which too great a quantity was given, a rational and moderate amount is all that is necessary, and even so it should not be the principal part of the diet. As is known, meat, unless mixed with other substances, causes emaciation, and moreover may cause a toxemia, a complication which has an undoubtedly bad effect on the tuberculous. Hence, the quantity of meat should never be large or dominate all other food-stuffs. Ham and chicken, and kidneys, lungs and liver, all of which contain cholesterin, should be included in the diet. Liver, especially, will be found to be of great service on account of its opotherapeutic qualities. Game that is already high, pork, extracts and meats put up in tins, should be strictly excluded.

Raw meat, contrary to what has been thought, is no longer considered indispensable, in fact not even useful in the majority of cases. Hence, it should be given only occasionally, and when poorly tolerated some other substance should be substituted until tolerance is re-established. Animal fats that do not contain cholesterin should not be included, since they may be difficult to digest. On the other hand, fish oil, roe, milt, by reason of their composition, rank high as factors in the diet for the tuberculous.

The utility of milk has been known for some time, but also in this instance, as has already been pointed out in the case of eggs, the tendency has been to abuse the quantity; and to-day the drinking of it during meals is considered injurious, since it overfills the stomach, thus retarding and interfering with digestion.

Vegetables should constitute an important part of the diet, since they are less toxic than meats. But the principal reason why they should be given without intermission is that in tuberculosis there is a decided elimination of the phosphates, which causes the anemia, and vegetables, because of their containing phosphorous and iron in quantities of goodly proportions and in a state that is assimilable, can counteract the bad results following this elimination. They also contain salts of lime and magnesia, and these are important in the recalcification of the organism.

Peas, beans and lentils contain, according to Professor Armand Gautier, phosphorous in its most easily assimilated form. They should therefore be used abundantly. Iron and lime salts are found more especially in green vegetables. This part of the diet is essential for another reason, since it counteracts constipation to

which both meat and eggs conduce. Fruits also possess this advantage and are to be recommended as well.

The feeding of the tuberculous, as has just been described, differs from the much-lauded over-feeding in this, that it is more adaptable to the healthy digestive tract. But even though it is more adaptable, what should be remembered is that tuberculosis is varied in its manifestations and the same diet cannot be prescribed for all its modalities. Hence it is necessary to modify the regimen according to circumstances, and to do this the symptoms of each case must be studied and the physician must be on the alert to detect contraindications. Where there is a tendency to congestion and hemoptysis, the alimentary formula should not remain unchanged, for even with the diet which has been set forth in this letter, if continued for some time, there may be symptoms indicating congestion. This is preceded by an elevation of the arterial tension, a symptom which should at once put the physician on his guard. If the arterial tension is already increased the amount of food which the patient has been taking should be decreased; the quantity of eggs, milk and meat should be lowered, and vegetables substituted. Where it is possible, eggs, milk and meat should not be completely abandoned, except in case of hemoptysis. If hemoptysis should occur, the diet should be exclusively vegetarian (vegetables and milk). In case the hemorrhage is accompanied with fever, all solid food should be withheld and only milk and vegetable bouillons ordered. Of course, this sort of diet is merely for the time being, and as soon as the symptoms of congestion abate, a more varied diet can be taken, although great care on the part of the physician should be exercised. In arthritic patients, in which there is habitually a tendency to congestion, the vegetable factors in diet should dominate eggs and meat.

When there is fever accompanying tuberculosis with no congestive symptoms, special dietary rules are not indicated provided the appetite is good and there is no gastro-intestinal intolerance. But although the modified diet, which has been advocated in the foregoing lines, may be adaptable, it is well to decrease the amount of food at each feeding but increase the number of times, at the same time observing with care the digestibility of the various foods.

On the other hand, anorexia and gastro-intestinal disturbances in the pyretic tuberculous are indications for a change in diet, but it is very difficult to outline just what plan should be followed. The physician should exercise his best judgment and modify the regimen according to the requirements of each case. Raw meat and eggs often render the greatest service; in intestinal catarrh, these are also very useful until the normal functions of the intestinal tract have been restored.

In alcoholics, the liver being very much altered, its antitoxic function is almost destroyed; it is no longer the defensive organ against the invasion of all sorts of toxins. The digestive functions are also of a low grade, all alcoholics being dyspeptics.

The indications in regard to aliments are not difficult to group. The insufficient function of the liver must be supplemented, and all endeavors should lead to the doing away of aliments which may increase the hepatic deficit. The majority of meats and fats should be suppressed; only brains, sweetbreads, liver, eggs, milk, etc., to

which farinaceous and green vegetables are added, should be prescribed.

As can be gathered from the foregoing, recent ideas on feeding for the tuberculous rest on two dicta: (1) Heed the integrity of the digestive tract and especially of the liver, and (2) increase the antitoxic substances secreted by the liver by giving foods in whose composition there is their equivalent. The diet to fulfil this purpose should consist of meat and vegetables, not of meat alone. It should never amount to over-feeding but to feeding on rational lines. At a time when feeding appears to be of more weight in the treatment of tuberculosis than all the drugs prescribed, the importance of what should or what should not be eaten by the patient cannot be too greatly emphasized.

PRACTICAL MEMORANDA.

By WILLIAM T. COUGHLIN, M. D., of St. Louis.

It does no harm to insist once more that rest is the most important principle to be observed in treating surgical tuberculosis, and what is next in importance is, it seems to me, the building up of the general nutrition of the patient by fresh air and proper feeding.

As a rule, it is well to remember that bone tuberculosis soon becomes bone and joint tuberculosis.

If a child under fifteen without a demonstrable tubercular lesion elsewhere gives a positive von Pirquet test in the presence of a chronic or subacute bone or joint lesion, this lesion is very probably tubercular.

If the first radiograph fails to show any definite lesion in bone or joint, and the trouble persists, be sure to have another made four to six weeks later.

Pain relieved by rest is the first symptom of bone tuberculosis, and spasticity of the muscles controlling the joint occurs just as soon as the joint is involved.

In tuberculosis of tarsal or carpal bones it will not be long before adjacent synovial cavities become involved, and some of these are very extensive. If the patient be an adult, rest alone will not cure the disease. It is better, as soon as the lesion is shown by the *x*-ray, to operate and thoroughly remove the whole cancellous part of the bone or else remove the bone entirely, otherwise the foot or hand will be destroyed.

The relation of tuberculosis to psoriasis has recently been studied by Sebillot, of Lyons. He has found that at least half of those attacked by psoriasis are the victims of active tuberculosis. This is a far higher proportion of tubercular disease than is found to accompany any other skin affection. He, therefore, believes that tuberculosis is an important etiological factor in psoriasis, if not indeed the dominant one.

The dysphagia of advanced tuberculous laryngitis and pharyngitis is a most distressing condition and one difficult to treat. Hinsberg, of Breslau, has devised a method of anesthetizing the sensitive area that is at once simple and, he claims, the most effective. A short time before food is to be taken, the patient is given a powder containing a sufficient dose of some local anesthetic. He uses orthoform or anesthesin. This powder is placed as far back as possible on the patient's tongue and the patient is told to attempt to swallow the dry powder. The powder is thus distributed over the tender areas and exerts its anesthetizing power to the utmost. To one accustomed to the modern method of anesthetizing the vesical neck

for cystoscopic work, this method looks as though it ought to be as good as its author claims. Of course, if the cause of the dysphagia is entirely within the larynx, the method is without value.

Tuberculous ulceration of the rectum is another process only less distressing to the patient than the same process in the pharynx and larynx. If the patient be in an advanced stage of pulmonary tuberculosis, of course nothing but palliative treatment is indicated. If, however, advanced disease elsewhere does not co-exist, an attempt should be made to cure the condition. Here, as elsewhere, in treating tuberculosis, rest to the part is *sine qua non*, and rest cannot be given the rectum and anus so long as the bowel moves (*per viam naturalem*). If the process be an extensive one or resists the usual methods of treatment by cleansing, cutting, cauterizing, or applications, etc., then one should not hesitate to divert the fecal stream by a sigmoidostomy; but in performing the operation one should take care to do it in such a manner that the artificial anus can be closed without the necessity of a major operation, and this is usually quite possible.

Opothrapy for tuberculous hemoptysis was called attention to first by Gilbert and Carnot in 1897, and recently Hadjoglou has published a thesis on the subject. The extract (dry) of calf's or pig's liver is used, and it is given in the form of pill, powder, or cachet. The fresh liver has been given up to 200 grm. a day. Of the dried extract, 12 grm. in lukewarm bouillon are given as soon as the patient is seen, and this is repeated at intervals of ten to twelve hours, as long as need be. As a preventive, 2 to 4 grm. daily may be given indefinitely in capsule or cachet.

D'Espine, of Geneva, insists that static ataxia is a very early sign, and an almost constant one, of tubercular meningitis in young children. To test for it, the child is placed in a standing position, and at once is seen to oscillate from side to side and if not supported will fall. If allowed to make a few steps alone, it staggers like a drunken person. He regards it as of value in differentiating nervous headaches, hysteria, or simple gastric vertigo from early tubercular meningitis.

Renal tuberculosis often exists when its presence is unsuspected, and yet there is hardly a locality in the body in which its presence can be so easily detected when proper steps are taken for its discovery. The attention of the patient is first directed to his bladder; his symptoms are those of cystitis, and it is for bladder trouble that he seeks relief; and to our shame, be it said, he is often treated for cystitis for months or even years before a diagnosis of the renal condition is made.

Frequency of micturition, then painful urination with tenesmus and burning and perhaps the passage of cloudy or bloody urine are the symptoms, and they always call for a complete investigation of the condition of the kidneys. The microscope reveals pus, and the urine is acid. Pus in acid urine means either colon bacil-

lus infection or tuberculosis. The cystoscope and ureteral catheters should be used at once, and the sediment obtained by centrifuge should be injected into a guinea-pig. In no other way can a positive diagnosis be made, and delay is criminal. In genito-urinary tuberculosis one kidney is most often the part first affected, and its removal will very often be followed by spontaneous cure of all the other parts involved.

Galliot reports his success with the method of Ferrier in the treatment of pulmonary and glandular tuberculosis in children. He regards it as being especially valuable among the children of the poor. It consists in the administration of the salts of lime, and he supplements it, where possible, with cod-liver oil. A powder or cachet containing carbonate of calcium and phosphate of calcium, 20 to 30 cgrm. of each, chloride of calcium 10 to 20 cgrm., calcined magnesia 3 to 10 cgrm., arrhenal 1 to 3 cgrm., according to the age of the patient, is given twice to three times a day for several months. With his patients good hygienic surroundings were impossible, and yet improvement was noticed in every case.

Massol and Bréton, while experimenting with subcutaneous injection of guinea-pigs, have observed that the tubercle bacilli are soon found in the blood, and that the more virulent the culture injected subcutaneously the earlier and the more intense is the bacillemia.

A case recently reported by Landouzy lends support to the idea of Poncet that erythema nodosum is of tubercular origin. He succeeded in producing tuberculosis in a guinea-pig by inoculating it with a portion removed from one of the erythema nodules.

We are indebted to Dr. Louis Boisliniere, Medical Director of Mount St. Rose Sanitarium, St. Louis, for the following rules and suggestions in the treatment of those afflicted with pulmonary tuberculosis:—

(1) All patients with elevation of temperature are kept in bed and given absolute rest as long as fever persists.

(2) All patients under treatment are obliged to rest in bed from 1 to 3 p. m. daily. This rest must be absolute; not even reading is permitted.

(3) To control the cough a correct diagnosis is most essential. The cough is either laryngeal or pulmonary. If laryngeal, there is very little if any secretion, and local treatment is all that is necessary—1 gr. heroin in 3 oz. water, sprayed in the throat has a marked analgesic effect. Such a cough can be easily controlled by applications to the interior of the larynx. If pulmonary, the cough very often occurs for the purpose of getting rid of the secretions. It is a matter of tremendous importance to determine this, because if there are secretions these must be gotten rid of, and such a cough should not be suppressed by the use of drugs. Teach all such patients to drain the lungs regularly by posture, even though the case be an incipient one when there is very little secretion. If only

one side is affected, this is drained by having the patient lie on the unaffected side. Remove the pillow and let the head hang slightly over the side of the bed. This position is maintained for ten or fifteen minutes. If both sides be affected, first one side is drained, and then the other. The procedure may be repeated several times at each 'sitting.' First drain the lungs in the morning on waking up, then again in the middle of the forenoon, before meals, and before going to bed. If the cough persist after drainage, then, but not until then, a sedative may be given. In the majority of cases no sedative is necessary. But if a sedative be needed, try to limit its use to the night.

The only cough mixture used at the Mount St. Rose Sanitarium, is morphine sulphate 1 gr. in syrup of wild cherry 3 oz. Dosage is 1 drm.

Night Sweats.—Medicine is rarely given. In fact we have noticed that night sweats are very uncommon among our cases (perhaps this is due to the method of keeping the lungs drained). Those encountered are generally easily controlled by an alcohol bath daily, and a daily change of all linen including all bed linen.

Control of Pain.—The patients are all more or less subject to neuralgias, pleurisies, etc., the pain of which may be so severe as to call for treatment. Again it is of great importance to make a diagnosis. Strapping with adhesive plaster may be of considerable help. An anodyne ointment composed of camphor 1 drm., chloral 1 drm., menthol 1 oz., oil of wintergreen 2 oz., oil of mustard 15 gtts. in lanoline, q. s. ad. 3 oz. Put in a collapsible tube. This is rubbed in frequently, and the results are highly gratifying.

Drugs are seldom used; if, however, one is confronted by one of these overwhelming intercostal neuralgias and sees it early, he can often stop it at once by hypodermic injection of $\frac{1}{4}$ gr. morphine at the most painful spot. If further treatment with drugs is necessary, codeine in small doses is used. No aspirin is used for pain or cough, because we have noticed that there seems to be a great liability to hemorrhage after the use of aspirin.

Tincture of green soap rubbed in once daily over the chest before going to bed hastens the absorption in pleurisies, especially in those of the fibrinoplastic type. It should be washed off every morning, and if signs of dermatitis supervene the treatment is withheld for a few days.

For Laryngeal Pain.—Blocking of the superior laryngeal nerves as they lie on the thyrohyoid membrane is the proper treatment. The nerve is easily found, as it lies below the superior cornu of the hyoid bone. The skin and subcutaneous tissue are anesthetized with $\frac{1}{2}$ per cent. novocain, and a needle loaded with the following mixture finds the nerve. Inject 1 c.cm. of the mixture; inject on one side or both as the case may be. The following is the mixture used:—

Cocaine hydrochlorate.	20 cgrm.
Morphine hydrochlorate.	5 cgrm.
Antipyrin.	5 grm.
Quinine bisulphate.	50 cgrm.
Sodium chloride.	10 cgrm.
Alcohol 80 per cent.	ad. 50 c.cm.

A reflex otalgia shows when you are in the neighborhood of the nerve. It is best first to inject with a $1\frac{1}{2}$ per cent. novocain solution some days before; this is sometimes sufficient and is not so painful.

Exercise.—There is only one way of regulating the patient's exercise and that is with the thermometer; exercise should begin gradually and be graduated.

Diet.—The nearer one can approach to the patient's normal diet the better. No forced feeding; the amount digested and not the amount ingested counts. Three full meals a day with one quart of milk and two or three eggs, raw or cooked, are found to work best.

The Heart.—Treatment of the heart is often overlooked. Many of the symptoms such as dyspnea, asthenia, etc., are due to cardiac dilatation. Rest in bed is the treatment; pay particular attention to the second pulmonic sound; if accentuated the vascular pressure is raised. If weak there is dilatation of the right heart. Any patient with dilatation of the right heart is in imminent danger of severe bleeding, owing to pulmonary engorgement. Cardiac therapy is indicated. The condition is especially liable to occur in fibroid phthisis.

Bleeding.—The patient must be kept quiet and his panic must be relieved. Morphine is invaluable. Of course, the patient is kept in bed, and he must remain there, for at least a week, after all hemorrhage has ceased. When one knows from which lung the blood is coming, the 'pulmonary excursion' can be limited by inserting a rolled bandage, from 6 in. to 8 in., under the margin of the ribs on that side, and holding it in place there with an abdominal bandage or adhesive strapping encircling the body.

If an ice bag is placed on the chest, place it where it will do the most good, and that is over the root of the neck, so that it will lie close to the pneumogastric nerve. Lower the patient's blood-pressure by giving Epsom salts. A large dose is given as soon as the patient is able to take it. We use no veratrum, nitroglycerine, aconite, or any other cardiac depressor. Give calcium lactate, and give from 20 to 30 gr., three times a day in milk, if there is a tendency to hemorrhage.

Death from bleeding is rather uncommon; the danger is not that of immediate death, but of inspiratory pneumonia. Control every hemorrhage, no matter how slight.

The best tonic for loss of appetite is to withhold all food entirely for a short time. Hunger is the best sauce.

Patients with laryngeal tuberculosis crave water and cold drinks. I have never seen a patient who could not drink sweet soda.

Remember that pulmonary symptoms must not be the only phase calling for treatment. See everything and treat everything, and do not forget that the patient must be looked after as well as the disease.

BOOK REVIEWS.

DIE KLINIK DER TUBERKULOSE. Handbuch und Atlas der gesamten Tuberkulose fuer Aerzte und Studierende. Von Dr. B. Bandelier, Chefarzt des Sanatoriums Schwarzwaldheim in Schoenberg bei Wildbad, und Prof. Dr. O. Roepke, Chefarzt der Eisenbannheilstaette Stadwald in Melsungen bei Cassel. Dritte vermehrte und verbesserte Auflage. Mit 79 Abbildungen und 18 Kurven im Text, sowie 189 Abbildungen auf 45 farbigen und 5 schwarzen Tafeln. Wuerzburg: Verlag von Curt Kabitzsch. 1914. Price, 26.50 m.

The above "Clinic of Tuberculosis" by Bandelier and Roepke is the third edition of one of the best books covering the entire field of tuberculosis, so far published. The first edition by these authors was issued in 1910, the second in 1912, and the above edition, on account of the rapid changes which have taken place upon the subject of tuberculosis, followed in less than a year. The book contains a most searching and detailed exposition of tuberculosis of all the organs and systems of the body, referring in a most scientific, yet practical, way to the questions relating to the anatomy, clinical course, diagnosis, prognosis and recent therapy of this disease. There are fifteen divisions of the subject with direct reference to a classified literature, seventy-nine illustrations with charts, and one hundred eighty-nine colored prints of tuberculosis of the skin, eye, nose, throat, lungs, glands, kidneys, bladder and other organs, besides innumerable skiagraphs of tuberculosis of the lungs in all stages, and a series before and after pneumothorax treatment. The main chapters with subdivisions, giving a general idea of the tremendous scope of the work, are as follows: (1) Etiology of tuberculosis; (2) tuberculosis of the lungs; (3) tuberculosis of the pleura; (4) tuberculosis of the upper passages; (5) tuberculosis of the gastro-intestinal tract; (6) tuberculosis of the genito-urinary tract; (7) tuberculosis of the blood-vessel and lymphatic system; (8) tuberculosis of the skin; (9) tuberculosis of the osseo-muscular system; (10) tuberculosis of the nervous system; (11) tuberculosis of the eye; (12) tuberculosis of the ear; (13) general miliary tuberculosis; (14) scrofula; (15) tuberculosis in children. The treatment of tuberculosis of almost every organ and tissue in the body is herein considered from every point of view. The prophylactic, hygienic, climatic, hydrotherapeutic, chemotherapy, serum and vaccine therapy, the mechanical methods of therapy, such as pneumothorax and surgical treatment, are all critically reviewed in an exact and decisive manner with many illustrations of apparatus and details of technique so as to place each means at the command of the reader. This volume is undoubtedly one of the most complete reviews of the literature summarized, abstracted and criticized by these two scientists, whose experience in years of investigative and clinical observations makes the essence of the text absolutely authoritative. For those who can read German, this volume is equal to a collection of recent works upon tuberculosis of all the organs of the body.

EARLY PULMONARY TUBERCULOSIS. Diagnosis, Prognosis and Treatment. By John B. Hawes, 2nd, M. D., Assistant Visiting Physician, Director Tuberculin Department, Massachusetts General Hospital, etc. With Preface by Richard C. Cabot, M. D., Assistant Professor of Medicine, Harvard University. New York: William Wood and Company. 1913. Price, \$1.50.

Probably one of the best of the smaller and cheaper books that have been written on the subject of pulmonary tuberculosis is the above one by Dr. Hawes on its early diagnosis, prognosis, and treatment. It is written for the general practitioner who sees the patient in the early stages of this disease and upon whom the responsibility of the recognition of this stage is dependent. This book is to be highly commended because it lays particular stress upon the important means of an early positive diagnosis. The essential points in the diagnosis, treatment and prognosis of early pulmonary tuberculosis are here given in a clear, concise and brief manner in a small and inexpensive volume. The author correctly states that "the number of physicians, who still demand the presence of tubercle bacilli in the sputum before making a diagnosis, is as-

tonishly large. The number of patients, whose first symptom was a hemorrhage which, according to their physician, came from the nose, throat or stomach and who later prove to have consumption, is equally great." Emphasis is placed upon a prolonged and most careful study of the patient himself, past and present history, and careful observation of the clinical course. The author is one of the first to announce boldly that not the examination of the chest alone or the use of the stethoscope and laboratory methods in specific reaction are sufficient to make an early diagnosis. The temperature chart and the changes in the general condition of the patient, and, as stated, common sense should lead to much earlier diagnosis. The book critically covers all methods of diagnosis, including later serum reactions, laboratory methods, x-ray examinations, etc., and gives illustrations, cases, charts, and skiagrams.

The appendix gives a very valuable addition of record systems, outdoor treatment under all circumstances and conditions, with sketches and pictures of numerous appliances and apparatus showing the easy application of same under such conditions. It is without doubt the sanest and best-balanced concise book on the early diagnostic methods and treatment of tuberculosis which has been written for a number of years.

TREATMENT OF TUBERCULOSIS. Ordinary Therapeutics of Medical Men. By Albert Robin, Professor of Clinical Therapeutics at the Paris Faculty of Medicine, etc. Translated by Dr. Léon Blanc, Physician at Aix-les-Bains, etc. With the Assistance of H. de Méric, Surgeon to the French Hospital, London. New York: The Macmillan Company. 1913. Price, \$5.25.

Dr. Léon Blanc certainly has conferred a great service on the medical men, both of England and America, by translating the above work on the treatment of tuberculosis by Professor Albert Robin. It is a quarto volume of 160 pages and gives the French version on the subject of tuberculosis up to the present year. It is unique from a number of standpoints, viz., in the manner in which the subject-matter is developed and the many unusual and yet plausible French views of this disease, most of which have not appeared in the German and English literature. It is free of all plates, diagrams and illustrations, yet the simple, direct and convincing descriptions make up, to a large extent, for what in this country is considered a defect. It is divided into six parts as follows: I. The soil of pulmonary tuberculosis and important indications as to treatment; II. Hygiene and alimentation; III. Treatment of phthisis; IV. Treatment of tuberculosis according to age and the associated morbid conditions; V. Treatment of extra-pulmonary tuberculous infections; VI. Social defense against tuberculosis. One is impressed with the broadening effect obtained from reading this volume. Upon the treatment of such tuberculous lesions with which we have been fairly well satisfied or rather with which we have felt content that the recognized treatment was well established, much additional knowledge is given. Without enumerating them individually, all forms of treatment have been considered from every standpoint. In some chapters the author has a peculiar method of giving all the arguments pro and con of certain debatable therapy and then a conclusive summary with convincing proof setting forth the indications for the particular treatment under discussion. All the later methods of therapy, with most of which the author has had personal experience, are given considerable space. This volume serves as a complement to recent treatments of tuberculosis, and is worthy of recommendation on account of the different views, as well as the wealth of facts expressed by one of the greatest French authors on the subject of tuberculosis.

EINE TUBERKULOSEFORSCHUNGSREISE NACH JERUSALEM. Von Hans Much. (Unter Mitarbeit von Drs. Canaan, Grussendorf, Hoffmann, Masterman, Severin, Wallach.) (Zugleich VI. Supplement-Band der Beiträe zur Klinik der Tuberkulose, herausgegeben von Prof. Dr. L. Brauer-Hamburg.) Wuerzburg: Verlag von Curt Kabitzsch. 1913. Price, 3.50 m.

The tuberculosis situation in Jerusalem, and in Syria generally, is peculiar. The first thing that strikes the medical visitor is the frantic fear with which the disease is regarded by the resident Mohammedan population. The tuberculous patient is thrust out the family circle and becomes an outcast. No one will consent to associate with him or to offer him a refuge. In comparison with tuberculosis, leprosy is looked upon with relative indifference, and people, to whom the cough of a consumptive is a signal for flight, will associate intimately and fearlessly with a leper. The situation, as regards these two diseases, is thus the reverse of that which obtains here and in Europe. The cause is not far to seek. In Syria, tuberculosis rarely runs the chronic course usual with us. It is typically an acute infection, extremely contagious, running a rapid course and is nearly always fatal.

In order to investigate this curious situation, the Hamburg Research Institute for Cancer and Tuberculosis sent an expedition to Jerusalem under the leadership of H. Much, of Much granule fame. During his three months' residence in Jerusalem, he undertook an extensive and intensive investigation of the problem, employing statistical, clinical and serological methods with equal ardor. For his very interesting conclusions, the reader must be referred to the original monograph. It appears that the reason for the malignancy of Syrian tuberculosis is to be sought in the fact that until recently this people was quite free from the disease; whereas we, on account of mild infection in childhood and because of a gradual elimination of the families most sensitive to the disease, have gradually acquired a relative immunity to tuberculosis. No such process has taken place in Syria. It may well be that the efforts of our anti-tuberculosis societies, if by some miracle they could be crowned with absolute success, would not result in an unmixed blessing to our people.

TUBERCULIN TREATMENT. By Clive Riviere, M. D. Lond., F. R. C. P., Physician, East London Hospital for Children, Shadwell, etc., and Egbert Morland, M. D. and B. Sc. Lond., M. D. Berne, of Arosa, Switzerland, Visiting Physician to the English Sanatorium (Villa Gentiana). Second Edition. New York: Oxford University Press. 1913. Price, \$2.00.

The second edition of "Tuberculin Treatment" has followed so shortly after the first edition which appeared in December, 1912, that it shows without a doubt that this work has been highly appreciated in the United States as well as in England, the home of the authors. This edition has been brought entirely up to date by the addition of new and important matters which have appeared during the past year. The extreme change in the views even regarding the tuberculin treatment of tuberculosis, the danger of ill effects of a general reaction, the grave doubts whether the production of focal reaction is harmful, and the standardization of tuberculin with the growing importance of an albuminous free tuberculin, have been particularly emphasized in this volume. Marked changes have been made in the chapters dealing with tuberculins and other treatment with tuberculin in mixed infections. In nearly every section some corrections and additions have been made. The book is divided into the following three parts with important properly divided subheads: I. The General Line of Tuberculin Administration; II. The Method of Immunization with Tolerance (Koch); III. The Method of Immunization without Tolerance (Wright). It embraces most of the valuable work on tuberculin therapy with complete reference to the literature of work done in this field, and must be credited with being undoubtedly one of the most conservative and authoritative guides on this subject.

PULMONARY TUBERCULOSIS AND ITS COMPLICATIONS. With Special Reference to Diagnosis and Treatment for General Practitioners and Students. By Sherman G. Bonney, A. M., M. D., Professor of Medicine, Denver and Gross College of Medicine, Medical Department of the University of Denver, etc. etc. Second Edition, Thoroughly Revised. With 243 Original Illustrations, Including 31 in Colors and 73 X-Ray Photographs. Philadelphia and London: W. B. Saunders Company. 1910. Price, \$7.00.

Bonney's book, of which the second edition is now at hand, is unquestionably one of the best textbooks on tuberculosis in the English language. The book is above all practical, and the reader will find in it excellent discussions especially of the symptomatology, physical diagnosis and hygienic management of consumption. The discussion of the specific treatment is less adequate; apparently the writer's personal experience with tuberculin is of recent date. There is, however, an interesting summary of the results obtained by him within the past few years in 130 cases treated chiefly with Koch's Bacillen Emulsion. On the whole, the results were satisfactory. Artificial pneumothorax, thoracoplasty and other surgical measures in the treatment of pulmonary tuberculosis meet with the author's disapproval. The cases that do well under this treatment are, he believes, just those in which we might expect good results without such radical measures.

L'HELIOThERAPIE. Par Le Dr. P. F. Armand-Delille. L'Oeuvre-Chirurgical. No. 75. Paris: Masson et Cie. 1914.

This interesting monograph furnishes further evidence of the strong foothold that heliotherapy is securing for itself as a form of surgical therapy. Armand-Delille outlines the history of heliotherapy, describes the action of solar rays on the human organism, details the types of disease that lend them-

selves favorably to treatment, and then describes the method of treatment. The author follows very closely the lines laid down by Rollier, and indeed, in his monograph, uses many of Rollier's illustrations. He concludes as a result of his study, that heliotherapy has caused a veritable revolution in medicine and hygiene, and that this revolution has been particularly remarkable in the field of bone surgery. Limbs that were formerly sacrificed or compromised as a result of joint resection are now restored *ad integrum*. Such results are attained chiefly in cases of tuberculosis of joints and bones, but comparatively similar excellent results are secured in the treatment of tuberculous foci situated anywhere in the body.

So enthusiastic an advocate of heliotherapy is the author that he recommends the sun baths not only to meet the indications set by disease, but also as a prophylactic measure, by the proper exercise of which he hopes to see a stronger, more robust and happier race result.

WUERZBURGER ABHANDLUNGEN AUS DEM GESAMTGEBIET DER PRACTISCHEN MEDIZIN. Herausgegeben von Prof. Dr. Joh. Mueller und Prof. Otto Seifert. 13 Band. 11 Heft. Ueber die Behandlung der Lungentuberkulose im Hochgebirge. Von Dr. H. Philippi. Wuerzburg: Verlag von Curt Kabitzsch. 1913. Price, 0.85 m.

The treatment of tuberculosis at high altitudes, as described by Philippi, differs in no wise from that at low ones. The bulk of his dissertation is devoted to tuberculin therapy. He is an adherent of small doses, and begins with one two-millionth of a milligram or less of Bacillen Emulsion, increasing the dose very slowly. He holds, with many others, that a tuberculin immunity is a very different thing from a tuberculosis immunity and that the latter is best attained by the production of a hypersensitiveness to tuberculin. He also urges the careful auscultation of the lung on the day following each injection, maintaining that a focal reaction, as shown by the appearance of fresh râles, may result even though there be no elevation of temperature and no redness at the site of puncture. The little monograph is well worth reading.

SANATORIA FOR THE TUBERCULOUS. Including a Description of Many Existing Institutions and of Sanatorium Treatment in Pulmonary Tuberculosis. By F. Rufenacht Walters, M. D., M. R. C. P., F. R. C. S., Joint Tuberculosis Officer to the Surrey County Council, etc. etc. Fourth Edition. Entirely Rewritten. London: George Allen and Company, Ltd. 1913. Price, 12 s. 6 d.

Dr. Walter's book is valuable in a number of ways. The first part is devoted to an interesting and instructive discussion of the methods and advantages of sanatorium treatment in tuberculosis. The second part contains an account of practically all of the tuberculosis sanatoria throughout the world, arranged by countries and sections of countries. The most essential information is given about every institution, while the more important ones are described in some detail. The information is exactly of the sort most valuable to the physician casting about as to the best place to which to send his tuberculous patient.

JOINT TUBERCULOSIS. By Leonard W. Ely, M. D., Consulting Orthopedist to the County Hospital; Attending Orthopedist to the Children's Hospital, Denver, Col., etc. etc. Illustrated. New York: William Wood and Company. 1911. Price, \$2.50.

Ely's work has caused so much comment and has been so thoroughly reviewed that at this date the reappearance of his book in a second edition calls only for a reiteration of praise and thanks. To all persons interested in surgical tuberculosis this work has come as a most helpful and illuminating messenger. The pathology of the bone and joint affections as explained by Ely is most satisfactory in that it clearly points out the reasons for therapeutic endeavors.

ADVICE TO CONSUMPTIVES. Home Treatment, After-Care and Prevention. By Noel Dean Bardswell, M. D., Medical Superintendent, King Edward VII. Sanatorium. Foreword by C. Theodore Williams, M. V. O., M. D., F. R. C. P., Consulting Physician, Brompton Hospital for Consumption and the King Edward VII. Sanatorium. New York: The Macmillan Company. 1910. Price, \$0.75.

The writer, who is medical superintendent of one of the large English sanatoria for tuberculosis, has for some years made it a practice to keep a note of every question, asked him by patients, apropos of consumption and its treatment. The questions, thus collected and classified, form the basis of the

present volume. Beginning with a popular discussion of the nature of pulmonary tuberculosis, he discusses in turn fresh air, food, rest, exercise and recreation, sanatorium treatment, occupation, emigration and disinfection. The book, in many ways, is ideal as a vade-mecum for the consumptive patient.

LECTURES ON TUBERCULOSIS TO NURSES. Based on a Course Delivered to the Queen Victoria Jubilee Nurses. By Olliver Bruce, M. R. C. S., L. R. C. P., Joint Tuberculosis Officer, County of Essex, Late Medical Superintendent, Queen Alexandra Sanatorium, London, Canada, etc. etc. With Illustrations. New York: Paul B. Hoeber. 1913. Price, \$1.00.

There is at present a definite demand for nurses with special training in tuberculosis. This demand is perhaps most marked in England, in connection with the Insurance Act, but is felt to a considerable extent everywhere. In brief compass the author has brought together the facts and the theories that it most behooves such a nurse to know. If he lays undue stress upon the doctrines of opsonins and vaccine therapy, this is perhaps pardonable in an Englishman. District nurses, in particular, will find the book useful, but need to read it somewhat critically.

CANCER. ITS CAUSE AND TREATMENT WITHOUT OPERATION. By Robert Bell, M. D., F. R. F. P. S., etc., Late Consulting Physician to the Glasgow Hospital for Women, etc. etc. Second Edition, Revised. New York: The Macmillan Company. 1913. Price, \$1.75.

It requires no small amount of effort to comprehend how, in this day of active cancer research, Dr. Bell has the temerity to bring forth a second edition of his work. The volume, as its last chapter testifies, is a protest against operations as affording a possible cure for cancer. This statement alone should be sufficient to condemn a volume ostensibly written in order to set laymen right in their thinking, but if more incriminating evidence were necessary it could easily be found in the numerous assumptions made by Bell without a scintilla of warrantable evidence, based almost entirely on such testimony as "I do not hesitate to believe," "I am fully convinced," and "even the ancients recognized."

We have always felt that in every seriously conceived volume there is a nucleus—however small—calling for favorable comment. How may we hope to voice praise for a volume from which the following is an excerpt: "Everyone, I suppose will admit that the integrity of the epithelium depends largely upon the unimpaired activity of the thyroid body. There is a distinct physiological relationship between the thyroid and the uterus, which fact was well known to the ancients. We must also conclude that if a debilitated condition of the nervous apparatus has resulted, as is invariably the case, when a chronic affection of the uterus has existed for a lengthened period, the normal functions of this gland must have been interfered with simultaneously with those of other organs. If, superadded to this, the original cause of the uterine mischief, usually a laceration or erosion, continues, the tendency of the epithelial cells in the immediate neighborhood of the lesion will be to pass from their healthy condition to that of malignity. I also look upon the rheumatic diathesis as a most important predisposing cause of epithelioma. My conviction is that uricacidemia is a factor without which malignant metamorphosis of cells cannot or at least, does not take place. I invariably supplement my special treatment with a course of aspirin, which seems to be antagonistic to the existence of *saccharomyces hominis*, these, I am convinced, being ferments which are concerned in the production of uric acid." (p. 37 *et seq.*)

LEHRBUCH DER PHARMAKOLOGIE. Fuer Aerzte und Studierende. Von E. Poulsson, Professor der Pharmakologie an der Universitaet Kristiania. Deutsche Original-Ausgabe besorgt von Dr. med. Friedrich Leskien in Leipzig. Mit einer Einfuehrung von Walther Straub, Professor der Pharmakologie an der Universitaet Freiburg/Br. Zweite Auflage. Mit 8 Figuren. Leipzig: Verlag von S. Hirzel. 1912. Price, 15m.

It is most gratifying to note that the advances in the theoretical sciences are being utilized by those who have to deal with the concrete problems of practical medicine. In the past decade chemistry has disclosed many of her secrets and we have gained by her aid a much clearer idea of many complex phenomena. There are those who for various reasons pay little heed to these steps in our quest for knowledge, and others who, allowing their fancy to run wild, build up in most unwarranted manner some grotesque figure of a new science on the basis of these same additions to our knowledge. To neither class belongs the author of this textbook of pharmacology, a fact all

the more worthy of remark, for in this one of the medical sciences perhaps more than in all others we have witnessed the wildest and most far-reaching claims for some remedy, based, however flimsily, upon a real or fancied relation to a newly discovered chemical fact. A work, such as Poulsson's, which takes cognizance of the advances in the allied sciences, but which subjects their application to pharmacology to a broad and rational critique, must be doubly welcomed. The chapters on the digitalis group, on the purgatives and on the anesthetics and narcotics are worthy of special mention on account of their excellent handling, though in the last named chapter the subject of nitrous oxide might be profitably treated from the side of the continuous gas-oxygen anesthesia as well as from the older classical side. The grouping of the subjects likewise calls for favorable comment. In short, this work of more than 500 pages is a most excellent one both for students and practitioners.

SURGICAL EXPERIENCES IN SOUTH AFRICA, 1899-1900. Being Mainly a Clinical Study of the Nature and Effects of Injuries Produced by Bullets of Small Calibre. By George Henry Makins, C. B., F. R. C. S., Senior Surgeon to St. Thomas's Hospital, London, etc. etc. Second Edition. New York: Oxford University Press. 1913. Price, \$3.75.

The appearance of this volume marks an epoch in military surgery in so far as it summarizes, most carefully, selected data from the field of modern warfare. For the civilian it is a difficult matter to extract the essential importance from the various medical histories of the various wars that have been waged; but to medical men—both those who are in and who are out of the service—a work like Dr. Makin's is a veritable beacon of information. The appearance of the volume just now is particularly opportune for American surgeons, so many of whom having recently enlisted in the medical reserve corps of the army.

The volume is much too detailed to permit of a worthy review in short compass; but it will suffice to stimulate interest if we merely mention that after an admirably full and yet concise chapter on general hygiene, transport, climate and surgical armamentarium, Makins discusses, in sequence, modern rifles and their action, general character of wounds produced by small calibre bullets, injuries to blood-vessels, bones, joints, head, neck, spinal column and cord, peripheral nerves, chest, abdomen, and the action of shells and their resultant wounds.

There is a wealth of clinical data pertaining to the surgery of war, and this is collected, arranged and presented in the clear, concise and interesting fashion that we have learned to expect of the English clinician. The illustrations are profuse and well executed. The personal attitude maintained by the author throughout the text lends added charm, interest and value to the volume.

INTERNAL SECRETION AND THE DUCTLESS GLANDS. By Swale Vincent, M. D. (Lond.), D. Sc. (Edin.), M. R. C. S. (Eng.), L. R. C. P. (Lond.), F. R. SS. (Edin. and Canada), Professor of Physiology in the University of Manitoba, etc. With a Preface by Professor E. A. Schaefer, F. R. S. Illustrated. New York: Longmans, Green and Co. 1912. Price, \$3.50.

This volume can be characterized most specifically as 'encyclopedic in small compass.' Such a characterization carries with it the corollary that the volume is not very readable. This is unfortunate, for we have in Biedel's bulky volumes a full and authoritative collection of the literature of internal secretion. What is needed is a fairly full digest of the material in assimilable form for the more or less casual reader. At best, the subject of internal secretion is essentially so complex, so hypothetical and so kaleidoscopic in character at present, that one's natural tendency is to postpone the attempt to master the subject until more evidence has been established.

Vincent has adopted an admirable method of presentation in that he clearly defines internal secretion, outlines the general method of investigation and then proceeds to the exposition of the mechanics, physiology and pathology of the internal secretory function of the various organs—liver, pancreas, kidney, intestinal and gastric mucosa, testis, prostate, ovary, adrenals, carotid and coccygeal bodies, thyroid, parathyroids, thymus, pituitary and pineal gland. In the chapters devoted to the adrenals, thyroid, parathyroids, thymus and pituitary, Vincent furnishes, in full, the essential data based upon comparative anatomy and histology and correlates these data with the clinical phenomena of disturbed function. By so doing he emphasizes the colossal equipment necessary to any investigator who hopes to blaze a trail in the tangled underbrush that overgrows the whole field of internal secretion.

SCIENCE AND EDUCATION. A Series of Volumes for the Promotion of Scientific Research and Educational Progress. Edited by J. McKeen Cattell. Volume II—Medical Research and Education. New York and Garrison, N. Y.: The Science Press. 1913.

In editing this series of volumes, Dr. Cattell has performed signal service. Although it is true that the subject-matter represented in most of the papers is caviar to the general lay and medical audience, nevertheless there exists a sufficiently large body of readers to warrant the task as it has been done.

Each of the papers represents some phase of the broad general problem of medical education in its relation to university, research, the medical school, the public, and the hospital; in addition to this somewhat limited scope, there are dissertations that broaden out beyond the plane of education, pure and simple—such as the contributions by Welch on the Interdependence of Medicine and the Other Sciences of Nature, by Bardeen on Medicine and Sociology and by the late Christian A. Herter on Imagination and Idealism in the Medical Sciences.

During the past ten years, there have been almost innumerable contributions to the literature of medical education. Of all these contributions Dr. Cattell has selected only twenty-eight. His capacity as an editor is reflected by his choice from the bulky material at hand. The twenty-eight papers selected represent the best that has been written in America on medical education.

The volume contains papers by the following authors: Richard M. Pearce, Wm. H. Welch, W. H. Howell, Franklin P. Mall, Lewellys F. Barker, Charles S. Minot, Walter B. Cannon, W. T. Councilman, Theobald Smith, George N. Stewart, Clarence M. Jackson, Elias P. Lyon, James B. Herrick, John M. Dodson, C. R. Bardeen, W. Ophuels, S. J. Meltzer, James Ewing, W. W. Keen, Henry L. Donaldson, Christian A. Herter, Henry P. Bowditch.

PREVENTIVE MEDICINE AND HYGIENE. By Milton J. Rosenau, Professor of Preventive Medicine and Hygiene, Harvard; Formerly Director of the Hygienic Laboratory, U. S. Public Health Service. New York: D. Appleton and Company. 1913. Price, \$6.00.

In this volume we have from the pen of a specialist almost the last word uttered upon this paramount subject. Truly it has been said that "medicine itself is only a branch of hygiene," and from this point of view the author has practically included all but the remedial measures, they having been supplanted by the more important preventive measures. The classification of the infectious diseases is rather unique, the author first considering under Section I diseases having specific or special prophylactic measures, diseases spread largely through the alvine discharges, diseases spread largely through discharges from the mouth and nose, insect-borne diseases, including the medical entomology concerned with this group, miscellaneous diseases, such as those contractable from animals, and mental diseases. In other sections, milk, meat, vegetables, air, soil, water, sewage, vital statistics, occupational diseases, school hygiene, disinfection, immunity and heredity are treated. One hundred and fifty-seven figures enrich the volume and considerably augment its teaching value. In certain domains the service of specialists has greatly enhanced their value, such as the chapters on sewage and garbage, vital statistics and mental hygiene from the pens of George C. Whipple, Cressy L. Wilbur, and Thomas W. Salmon, respectively. The book is heartily recommended to students and practitioners of medicine as well as of hygiene, and the author is to be congratulated upon its completion.

OPHTHALMOSCOPIC DIAGNOSIS. Based on Typical Pictures of the Fundus of the Eye with Special References to the Needs of General Practitioners and Students. By Dr. C. Adam, Assistant at the Kgl. Univ.-Augenklinik, Berlin. Translated by Matthias Lanckton Foster, M. D., Ophthalmic Surgeon to the New Rochelle Hospital, etc. etc. With 86 Colored Pictures on 48 Plates and 18 Illustrations in the Text. New York: Rebman Company. 1913. Price, \$6.00.

The earlier textbooks on ophthalmoscopy, such as those by Jæger, Mauthner, Schweigger, etc. started from clinical conceptions of disease and portrayed these with all their details and symptoms. The present author has followed the lead of Elschnig, in his article in Axenfeld's textbook, in taking the ophthalmoscopic symptoms as the basis for classification. As the author states in the preface, "the real purpose of this book is to be a systematic guide to diagnosis," and hence the words "Ophthalmoscopic Diagnosis" has been preferred to "Atlas" because the latter too forcibly emphasizes the illustrations.

The plates are uniformly excellent, and portray with remarkable fidelity of tint and detail the more important ophthalmoscopic lesions. Opposite each plate is a brief explanatory text.

Each series of plates is preceded by an adequate account of the anatomy of the structures depicted, together with an explanation and interpretation of lesions in the terms of pathology. It would be hard to exaggerate the value of these authoritative and well-systematized chapters, especially to the beginner in the fascinating art of ophthalmoscopy.

PYORRHEA ALVEOLARIS. By Friedrich Hecker, B. Sc., D. D. S., A. M., M. D., Member of the Academy of Science of St. Louis, Mo.; Consultant at Bell Memorial Hospital of the School of Medicine, University of Kansas, Rosedale, Kansas, etc. Illustrated. St. Louis: C. V. Mosby Company. 1913. Price, \$2.00.

This monograph of 157 pages is an extensive study of this interesting subject which has recently been brought forward on account of the clinical studies made on the interrelationship of gum lesions and other diseases. In this work the author attempts to negate the common conception held by most dentists that pyorrhea is a local disease. He believes that it is due to "constitutional and exciting causes which lower the vital resistance of the alveolar process, and that it is an accompaniment to an associated condition of some general disease." Considerable work is given on the local pathology of pyorrhea, and the treatment of the disease based upon the diagnosis is given in detail. Autogenous serums are emphasized as being of special value in this treatment. Probably the most commendable parts of the book are those devoted to the studies of the bacteriology of the mouth. These chapters give the simple, clear and concise methods during ordinary bacteriological work, which, if carefully studied by the dentists for whom the book is exclusively written, would undoubtedly not only be of value as a means of clearing up local lesions of the mouth, but also probably create a desire for thorough investigation of really important lesions by the medical man, who has the greatest and most frequent opportunity to carry these out.

PRACTICAL SANITATION. A Handbook for Health Officers and Practitioners of Medicine. By Fletcher Gardner, M. D., Captain Medical Corp, Indiana National Guard, etc. etc., and James Persons Simonds, B. A., M. D., Professor of Preventive Medicine and Bacteriology, Medical Department, University of Texas, etc. etc. Illustrated. St. Louis: C. V. Mosby Company. 1914. Price, \$4.00.

As may be gathered from the title, this book fits a place for which a reference book is greatly needed. In our country, health officers, especially in small communities, do not always have at their command too much literature pertaining to the many-sided duties they are called upon to perform. This book seems to fill very nicely the need of a compact, non-technical and moderate-priced volume which shall aid in the proper conduct of sanitary service.

The completeness of the book may be noted from the table of contents. All infectious diseases are outlined in a concise but thorough manner. Tropical diseases are given the attention that they deserve. The parts of the book on general sanitation include the latest ideas on a wide range of subjects, from garbage disposal to 'swatting the fly,' and from pure milk to factory and work-house inspection.

A worthy inclusion is a chapter on laboratory methods, the particular value of which is the giving of the proper technique for obtaining specimens for submission to experts.

The publishers deserve credit for the excellent appearance of the volume.

PATHOGENIC MICRO-ORGANISMS. A Textbook of Microbiology for Physicians and Students of Medicine. By Ward J. MacNeal, Ph. D., M. D., Professor of Pathology and Bacteriology in the New York Post-Graduate Medical School and Hospital, New York. With 213 Illustrations. Philadelphia: P. Blakiston's Son and Co. 1914. Price, \$2.25.

This book possesses much merit and will no doubt be favorably received by the profession. The popular textbooks on bacteriology give relatively too much attention to bacteria as agents of disease and not sufficient attention to other micro-parasites. This book is an indication of the present tendency toward the displacement of textbooks on bacteriology by books on medical microbiology.

Dr. MacNeal has covered the subject so briefly that his book does not seem suitable for adoption as a single textbook for medical students; but as a

reference book for the student, the physician, and the bacteriologist it can be highly recommended.

The author's broad understanding of his subject has made possible his excellent choice of material. Notwithstanding his brevity he has included numerous facts not included in some of the larger works. The introduction contains an historical sketch superior to those of many of the popular texts. The illustrations are numerous and are the choicest which could be obtained from the various sources available.

THE NERVOUS AND CHEMICAL REGULATORS OF METABOLISM. Lectures. By D. Noël Paton, M. D., B. Sc., Professor of Physiology in the University of Glasgow. New York and London: The Macmillan Company. 1913. Price, \$2.00.

Animal metabolism is under a twofold control, that of the nervous system and that of the internal secretions. Until recently, physiologists were inclined to consider these agencies as acting independently of each other and to regard chemical regulation as something quite independent of nervous regulation and more fundamental than it.

But it is possible that these products of the activity of organs, these internal secretions, exercise their influence not directly on the tissues, but through the nervous system; that, instead of the chemical regulation being an older and more fundamental mechanism than the nervous, it is really a newer one largely developed to facilitate and to regulate the action of nervous adjustment.

The enormous mass of information which has now been collected concerning the internal secretions, their action, mode of production and interrelations has put us in a position to take a general view of the situation, and to give at least a partial answer to the questions of how they are related to the action of the nervous system.

The discussion of these problems is most vivid and instructive, and the perusal of these lectures can be recommended to every physician who retains his interest in physiological problems.

HOUSE FLIES AND HOW THEY SPREAD DISEASE. By C. G. Hewitt, D. Sc., Dominion Entomologist, Ottawa, Canada. 19 illustrations, 122 pages. New York: G. P. Putnam's Sons. 1912.

No attempt is made to consider all our common flies in this little volume, but it is confined to those flies which are most commonly found in and about dwellings, mainly the domestic species of this family of diptera. The house fly (*Musca domestica*), now commonly known as the 'typhoid fly' is dealt with in a clear, concise manner; its gross anatomy, life history, habits and its manner of disease-spreading propensities are dealt with in a sufficiently simple manner to be understood with ease by the laity; also with reference to the special specific diseases spread by it. Other common species are dealt with also. Lastly, the author gives the most common natural destructive agents that we possess to inhibit the excessive spread of these insects and the artificial agents we have at our command at present. The volume is commendable and should be in the hands of all hygienists, public health workers, medical men, and all interested in this work, for its brevity and simplicity combined with its scientific value are easily understood by anyone wishing to secure a working knowledge of this subject.

THE ELEMENTS OF BACTERIOLOGICAL TECHNIQUE. A Laboratory Guide for Medical, Dental, and Technical Students. By J. W. H. Eyre, M. D., M. S., F. R. S. (Edin.), Director of the Bacteriological Department of Guy's Hospital, London, etc. etc. Second Edition, Rewritten and Enlarged. Philadelphia: W. B. Saunders Company. 1913. Price, \$3.00.

The publication of a revised second edition of this volume is sufficient to demonstrate its appreciation by the profession, for it has always been a complete, clear and reliable manual of laboratory technique. The new edition contains, besides bacteriological methods, numerous latest improvements in pathological technique, thereby being as useful for the pathological as for the bacteriological laboratory. The 219 illustrations add considerably to its practical value, thereby providing even independent workers with sufficiently simple erection of apparatus thoroughly reliable for more than average work. The exercises and descriptions of the procedures are characterized by their conciseness, although consistent with the knowledge they are meant to convey. The volume is altogether commendable, is well indexed, and should be in every bacteriological and hygienic laboratory.

RADIUM AS EMPLOYED IN THE TREATMENT OF CANCER, ANGIOMATA, KELOIDS, LOCAL TUBERCULOSIS AND OTHER AFFECTIONS. By Louis Wickham, M. V. O., Médecin de St. Lazare; Ex-Chef de Clinique a l'Hôpital St. Louis, and Paul Degrais, Ex-Chef de Laboratoire a l'Hôpital St. Louis, Chef de Service au Laboratoire Biologique du Radium. Translated by A. and A. G. Bateman, M. B., C. M. With Fifty-three Illustrations. London: Adlard and Son (Paul B. Hoeber, New York). 1913. Price, 2s. 6d.

There is a superabundance of literature upon radium and radio-active bodies at the present time, but anything from the pen of the late Dr. Wickham and Dr. Degrais upon this subject is always acceptable and of great value.

This little book is intended for the popular exposition of the subject of radium in malignant diseases and is written in such a way that all can understand. For instance, the first chapter opens with the question: "What exactly is radium?" which is naturally followed by an introduction as to what is radio-activity. In this way the authors proceed and endeavor to discourse in as lucid a manner as possible the various theories as to the action of these bodies, their indications in diseases and their methods of application.

Several graphic illustrations show the apparent wonderful effects of radium and radio-active salts upon various malignant conditions.

The book should be of great value to anyone interested in the subject.

SURGERY OF THE VASCULAR SYSTEM. By Bertram M. Bernheim, A. B., M. D., Instructor in Surgery, The Johns Hopkins University, Baltimore, Md. With 53 Illustrations in Text. Philadelphia and London: J. B. Lippincott Co. 1913.

This excellent monograph illustrates the need of similar little volumes devoted to kindred subjects. In a brief historical note, by way of preface, Dr. Bernheim outlines the evolution of surgery of the vascular system, and then devotes ten chapters to general technique, transfusion, end-to-end anastomosis, lateral anastomosis, transplantation of a segment of vein or artery, reversal of circulation, varicose veins, surgery of the heart, and aneurysms.

An admirable personal tone characterizes the work throughout, and yet there are full citations from the literature, with references, and an excellent selective description of methods and views other than those of the author himself. For example, under the head of transfusion, Elsberg's technique and Crile's method are given in detail, side by side with Bernheim's method.

The illustrations really illustrate, and the volume as a whole is a credit both to its author and to the publishers.

A LABORATORY MANUAL OF INVERTEBRATE ZOÖLOGY. By Gilman A. Drew, Ph.D., Assistant Director of the Marine Biological Laboratory, Woods Hole, Massachusetts. With the Aid of Former and Present Members of the Zoological Staff of Instructors at the Marine Biological Laboratory, Woods Hole, Mass. Second Edition, Revised. Philadelphia: W. B. Saunders Company. 1913. Price, \$1.25.

This handy and practical laboratory guide deals with the most common classes of invertebrates, ranging from the unicellular or Protozoa to the Chordata, and including the more important subclasses of Protozoa, such as Amoebina, Flagellidia, and order Hemosporidia which are occupying considerable attention at the present day on account of the position they hold as disease producers. While no attempt is made to deal with each class in detail, nevertheless it is written in a simple, clear manner and is specially adaptable to students desiring a working academic knowledge of this important branch of science. The common English names are given wherever possible, in order to simplify and facilitate the pursuit of the work, and there is also a glossary explaining the common biological terms used throughout the text. A few notes are added giving the directions for fixing, washing, dehydrating, staining, clearing, and mounting the specimens.

HEART DISEASE, BLOOD PRESSURE AND THE NAUHEIM TREATMENT. By Louis Faugeres Bishop, A. M., M. D., Clinical Professor of Heart and Circulatory Diseases, Fordham University, School of Medicine, etc. etc. Fourth Revised Edition. New York: Funk and Wagnalls. 1913. Price, \$3.00.

The fact that four editions of Dr. Bishop's little book have been called for within six years is the best evidence of its popularity. It is written by a clinician of wide experience, not for the specialist but for the general practitioner. Its easy style, its originality and its personal note make it pleasant and instructive reading. On the other hand, it has the faults of its qualities. A certain garrulousness invites to skipping, and occasional inaccuracy

of statement may lead the reader astray. It is pretty generally conceded that the diastolic pressure with the auscultatory method is not marked by the cessation but by the blunting of the vessel sound. As in most books on the subject, nothing is said of the effect, sometimes considerable, of deep respiration upon the blood-pressure. Such faults however are not fatal, and are more than counterbalanced by the constant good sense that pervades the book.

THE PATHOLOGY OF GROWTH OF TUMOURS. By Charles Powell White, M. D., F. R. C. S., Director, Pilkington Cancer Research Fund, Pathologist, Christie Hospital, Manchester, Special Lecturer in Pathology, University of Manchester. Illustrated. New York: Paul B. Hoeber. 1913. Price, \$3.50.

Such ponderous tomes have been written on tumors, particularly on cancer, of late, and such a mass of literature has arisen on the subject, due no doubt to the energy necessary in spending the endowed funds of cancer research laboratories, that it is a pleasure to find a simple little manual like this book which tells us in a very straightforward way the essential facts that the ordinary man ought to possess about tumors.

In the course of 200 pages the author takes us over the field of growth, first in relation to variations, regeneration, etc., and then goes on to tumors. Not only is the morphology discussed but the physiology of new growths is considered as well. There is a chapter on causation of tumors.

The book is well illustrated with many original photomicrographs.

THE ANATOMIST'S NOTEBOOK. A Guide to the Dissection of the Human Body. By A. Melville Paterson, M. D. Edin., F. R. C. S. Eng., Professor of Anatomy in the University of Liverpool; Examiner in Anatomy: University of London, Conjoint Board (Royal Colleges of Surgeons and Physicians), Indian Medical Service, etc. etc. New York: Oxford University Press. 1914. Price, \$2.00.

The preface of this volume states the object of the book to be merely that of a help in the study of practical anatomy and that it is to be used essentially in the dissecting room. We may say that this object has been more than adequately fulfilled. The text consists of short, specific, clear instructions to the students, emphasis being developed by the use of black-faced type and italics. The illustrations are for the most part of the simple line drawing type, so well adapted to orienting the student in his dissections.

A COMPEND OF DISEASES OF THE SKIN. By J. F. Schamberg, A. B., M. D., Professor of Diseases of the Skin, Philadelphia Polyclinic and College for Graduates in Medicine, etc., etc. Fifth Edition, Revised and Enlarged. With 112 Illustrations. Philadelphia: P. Blakiston's Son and Company. 1913. Price, \$1.25.

Compendes are probably of use to students under certain circumstances, but from the present-day ideas of teaching, they are not to be recommended, since on account of their necessary brevity they do not give sufficient clinical and pathological details. But, as compends go, this is an excellent one, since the author has given the work the stamp of his broad experience, and it contains a wonderful amount of data for such a small volume.

LE TRAITEMENT DE LA SYPHILIS PAR LE 606. Par le Dr. E. Jeanselme, Professeur Agrégé à la Faculté de Paris Médecin de l'Hôpital Broca. Paris: Masson et Cie. 1913. Price, 1 fr. 25.

Jeanselme is an authority on protozoic diseases, especially those in relation to tropical medicine. This short monograph of forty pages is devoted to the modern treatment of syphilis.

The first part is a short discourse upon the progress of the study of syphilis. He goes over, in the balance of the monograph, the well-beaten path of the various contraindications and a critical survey of the results produced in the treatment of syphilis with salvarsan.

A MANUAL OF THE X-RAY TECHNIC. By Arthur C. Christie, Captain, Medical Corps, U. S. Army, etc. etc. With 42 Illustrations. Philadelphia: J. B. Lippincott Company. 1913. Price, \$2.00.

The author of this book has been able to put the technique of modern roentgenology into one hundred pages because he has eliminated all redundancy, and the descriptions are short and to the point. Historical roentgen data have been eliminated. The book has been prepared with a view to the needs of the

medical service of the United States Army, but, as the author states, it may also be found useful by that increasingly large number of physicians and surgeons in private practice who find it necessary or expedient to do their own x-ray work for diagnosis. One will find this book to be eminently satisfactory as a textbook for medical and lay roentgen assistants. This book is exactly what it claims to be—a short manual on the technique of x-ray examination,—and as such is heartily recommended.

MUELLER'S SERODIAGNOSTIC METHODS. Authorized Translation from the Third German Edition. By Ross C. Whitman, B. A., M. D., Professor of Pathology, University of Colorado School of Medicine. With 7 Illustrations in Text. Philadelphia and London: J. B. Lippincott Company. 1913. Price, \$1.50.

This little book presents in a clear and concise form the more or less complicated methods involved in carrying out the various serodiagnostic tests. It is a good handbook for the laboratory worker, embracing as it does the various modifications of such tests as the Wassermann reaction for syphilis, the agglutination reaction for typhoid, estimation of the opsonic index, etc. It may likewise be recommended to those non-laboratory workers among the profession who may wish to gain some appreciation of the advantages, difficulties and limitations of this field of diagnosis.

INDIGESTION, CONSTIPATION AND LIVER DISORDER. By G. Sherman Bigg, F. R. C. S. Edin., M. R. C. S. Eng., Licentiate of the Society of Apothecaries, London; Surgeon-in-Charge, Native Followers' Hospital and Women's Hospital, Allahabad, India. New York: Paul B. Hoeber. 1913. Price, \$1.50.

A curious book, full of contradictions, characterized at once by keen clinical observation and fanciful a priori physiology, by a preference for the older Galenical remedies and a strong leaning toward proprietary preparations, by an appreciation of the importance of dietetics and a fondness for polypharmacy. Here and there the critical reader may derive a useful hint from the perusal of the book, but it is doubtful, to say the least, whether it deserves a place on the physician's book-shelves.

TEXTBOOK OF ANATOMY AND PHYSIOLOGY FOR NURSES. By Amy E. Pope, Author, with Anna Caroline Maxwell, of "Practical Nursing," and Instructor in the School of Nursing of the Presbyterian Hospital in the City of New York. With 135 Illustrations. New York: G. P. Putnam's Sons. 1913. Price, \$1.75.

This volume admirably serves the purpose for which it is written. The tendency so strongly marked to-day in the education of trained nurses to supply them with confusing detail has been avoided, and only such essentials included as are necessary in the routine of intelligent nursing.

The method of skilfully combining anatomical and pathological data, instead of furnishing uncorrelated facts, must be commended highly, and this factor plus the excellent paging, clear illustrations and good type make the volume a valuable adjuvant both to the nurse in training and to the graduate.

THE SURGICAL CLINICS OF JOHN B. MURPHY, M. D., AT MERCY HOSPITAL, CHICAGO. Volume II, Number VI. December, 1913. Published Bimonthly. Philadelphia: W. B. Saunders Company. 1913. Price per year: Paper, \$8.00; cloth, \$12.00.

This volume of the "Clinics" is particularly interesting in that it presents very clearly Murphy's personal views, technique and results on the subject of artificial pneumothorax as a method of treating tuberculosis of the lung.

Murphy's remarks on gall-bladder disease, his counsel to students on the importance of sound inductive reasoning based on purely clinical facts, and his incisive analytical method are evidences of masterly force.

BAKTERIOLOGISCHES TASCHENBUCH. Die wichtigsten technischen Vorschriften zur bakteriologischen Laboratoriumsarbeit. Von Dr. Rudolf Abel, Geheimem Ober-Medizinalrat in Berlin. Siebenzehnte Auflage. Wuerzburg: Curt Kabitzsch. 1913. Price, 2 m.

Since 1903 a new edition of Abel's little bacteriological guide has appeared every year. Indeed, new methods or new modifications of old ones appear so frequently that only in this way can the book be kept abreast of the times. For those who know the previous editions, it will suffice to say that the new one is quite up to the standard of its predecessors. It is the best pocket-guide to bacteriological technique of which we have knowledge.

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EDITORIAL.

HOLMES AND SEMMELWEIS.

Medical literature of the ephemeral sort would indeed be monotonous reading were it not for the controversies which enliven the pages of our weeklies and monthlies, and the discussions, mostly heated, as to the efficacy of a new discovery and whether priority belongs to this or that investigator. In an age when a constant stimulus is necessary to keep the spirits of the reading public from sinking into a state of indifference, at a time when we want to see every wrong righted and every original thinker and worker properly placed and every discoverer in the matter of research work awarded his just dues irrespective of what a future generation may think, it is meet that editors of medical journals should gratify this desire of a public saturated with justice. But in meeting this demand it would be well for these same editors not to overlook the fact that in a former age when justice was not the exquisitely proportioned attribute which it is to-day, our predecessors were given to a laxity that was quite despicable; in fact, were so remiss in placing thinkers and investigators in the niche to which their labors entitled them, that it behooves us of the present day to arrange matters so that a certain degree of justice may be effected. And with this sort of thought in mind, we take it, an editorial writer* was inspired when he started anew the contention that to Oliver Wendell Holmes and not to Semmelweis belong the laurels of being the discoverer of the contagiousness of puerperal fever, and that this being the case a statue should be erected to the genial author of the "Autocrat of the Breakfast-Table" similar to the one the grateful Hungarians erected a few years ago to the memory of their distinguished countryman, and

*Holmes, not Semmelweis (*Journ. Amer. Med. Assoc.*, p. 1177, April 11th, 1914).

an annual dinner with addresses be given to keep the memory of the American originator of the theory that puerperal fever is a contagious disease ever fresh in the minds of the American people.

That the writer of the editorial has the point of view becoming one who is an enthusiast of justice cannot for a moment be questioned; but what can be questioned is his nationality, for his words betray that he must be a naturalized American and not of simon-pure stock, otherwise he would not be solicitous to know why a discoverer of the origin of a certain disease, or for that matter the writer of an epoch-making book, or the painter who has brought honor to his country, or the historian or philosopher, has invariably remained unhonored as regards a statue and annual addresses in this country. His eyes and his common sense would teach him at once, were he the American who has not been corrupted by the addition of a few drops of foreign blood, that while the Danes in this country have honored Hans Christian Andersen, the Germans Goethe and Schiller, the Americans Shakespeare, Humboldt, Washington, Lincoln, and Generals too numerous to mention, Poe, Irving, Motley, Prescott, Emerson, Hawthorne and Longfellow have not as yet been immortalized by the erection of stone effigies. It is the custom of the country; so why express surprise that a negligence of this sort should obtain on all sides to demonstrate our apathy to the men who have shed honor on their nationality?

But there is another side to the question, and a very good one, especially in this country where the sin is so rampant that he must be in the lowest state of artistry not to have noticed it. Who has not turned askance from the statues that deface our public squares and parks and expressed the hope that the writer or philosopher or painter who stands high in his estimation would never be caricatured in like manner? Is there justification for so rebellious an attitude? Assuredly there is; and supposing there are hundreds nay thousands of the same opinion, have we not here an excellent reason why certain distinguished men have not been honored? Perhaps, after all, we Americans with the saving grace of our sense of humor are not so inappreciative as would at first appear, but are opposed to having our midribs tickled by angularities and facial deformities, not to mention Roman togas and ill-fitting frock-coats, in any one of the men whom we have pictured as of normal physical proportions, albeit their minds may have been a bit abnormal. This is a charitable view to take of our gross indifference and is hardly explanatory, but being firm believers in the gratitude of all people, no matter what their race or religion, to their men of light and leading, we cannot believe that our sense of humor is not an active factor in preventing the erection of statues to those men the delicacy of whose literary art would be prostituted by the bronze effigies which are the annual output of our factories for the desecration of the art of sculpture.

In a clever essay, "The Mobled King," in the *Smart Set* for April, Max Beerbohm, the English wit, has much to say on whether it would not be better for the sake of our nerves, and perhaps our tempers, if a great many statues that are now exposed to the fierce light of day were veiled all the year round, so that other ideas than those gleaned from the stone monstrosities would remain with those who may have preconceptions as to what distinguished men really looked like. Of course, London statuary is what he has in mind; but though this is bad enough, how much more applicable are his witty remarks to the American products! And continuing the English essayist's thought: Perhaps if all the statues that mock us to-day as we walk through our streets and parks were mobled, a saner and more artistic conception would arise as to what a distinguished man should represent when his lineaments are put into stone or bronze, and some unpractical reader of books, who was not always tending the American eagle, preening its feathers and gorging its stomach with indigestible gobs of patriotic food or worshipping at the shrine of some millionaire, might start a propaganda to erect statues to our literary men to prove to the American people that the art of American sculpture, though a failure when it was limited to Generals and a few Presidents, is an altogether different matter when the sculptor has to show the dominance of mind over matter. Let us hope that when this halcyon time arrives among the first to be honored will be Oliver Wendell Holmes.

P. S.

DOCTORS IN MODERN DRAMA.

The popularity of certain characters in the drama of to-day is not easily understood even by him who is a regular attendant at the theatre or has pondered the question in the quiet of his study. Managers have told us through the medium of the Press that in putting really objectionable characters or plays on the stage they are meeting a public demand, and that though they themselves may be bitterly opposed to the burlesquing of certain racial attributes or the presentation of what is grewsome and pathological, they cannot do aught but abide by public decision. This may be true or not; but where there is a flaw, and a very perceptible one, in their interviews is the declaration of the simplicity of their mental workings and the hope that the gullibility of the public will act nicely in assisting in the swallowing of their statements without demur. But for the sake of doing away with argument and all those recriminations which invariably broider it to make it the ugliest chapter of spoken or written speech, let us concede that the managers are truthful and that their mission is to obey even the slightest wish of the public. Does this explain why so many doctors are in the

plays of to-day, and why they are always automata who are either 'First Aiders to the Sick,' or quiet and unobtrusive gentlemen who attempt to assure the audience, more than the patient on the stage, that the 'trouble' is mending and that in a few days he will enjoy all the comforts of life, when the audience knows only too well that the doctor is resorting to trickery and that before the play is over the heart trouble will end the patient's life suddenly or the sight will be destroyed forever.

In *Harper's Weekly* of April 18th, there is a short article that bears the title "Doctors in Drama," in which the writer is quite rejoiced that "current plays emphasize the doctor as one of our most dramatic figures." Whereupon he cites a large number of plays to show the exalted rôles played by these "dramatic figures." Being neither *au fait* with all the plays mentioned nor close students of the dramatic tendencies as exemplified on our stage to-day, we may be incapable of recognizing the high value of the mission of the doctors in the cited plays; but even with a rather incomplete knowledge of the latter, we will hazard the remark that nearly all the doctors figure in the time-honored rôle of the gentle adviser, the beneficent attendant, the expert at stopping hemorrhages (stage hemorrhages, at that!), or the wearisome, talkative gentleman, but never as the hero in the best sense of that much-abused term. In fact, it would appear that directly a dramatist conceives the idea of 'creating' a doctor for one of his plays, he fashions something sombre, at times taciturn, again talkative,—something that is ever present but quite invisible until a dear friend gets into trouble, as in Robert Hichens' "Belladonna," or a master is needed for a direful situation, as in H. R. Lenormand and Jean d'Aguzan's one act play, "Fear." Strong, mentally speaking, he always is, but never a stage hero with some of the weaknesses of mankind.

It may be asked here why should the doctor in a play always be the kind friend, the amiable, uncomplaining person who is satisfied to spout a bit of science, to help the poor by dividing his last dollar with them, the staunch believer in the goodness of people to such an extent that he never locks his door against the possible invasion of thieves? Surely, he has other attributes; and while they may not be on the exalted plane of those we have mentioned, they are human, and perhaps as Nietzsche would say, too human. But they declare him a citizen of a community, an entity that differs in no sense from other beings who have ambitions and desires and appetites that are wrong and faults and weaknesses that may be counted against them. In fact, a doctor's psychology is just as interesting as the merchant's or the professor's or the doubting minister's or the rich socialist worker's, and might be exploited by our dramatists without offence to the medical profession. And if the dramatist is brave, is fearless of public opinion or of the denuncia-

tions of provincial medical societies, he could start the reform which we so greatly desire by taking a subject which has always appealed to us as 'full to choking' with dramatic possibilities, especially after we have been bored to exasperation by the usual stage doctor. Reference is here made to the George Sand-Pagello incident which started blithely in Venice and ended quite tragically in Paris: The meeting of George Sand, the most intellectual woman in Europe, and the Venetian doctor, young and handsome, but far from intellectual, at the bedside of Alfred de Musset, the idolized poet of France, a degenerate and a drunkard, whom Dr. Pagello was treating for delirium tremens and who had gone to Venice on account of his liaison with George Sand; the appeal of the clean, young doctor to the woman who was disgusted with the poet on account of his habits; the final break with Musset; George Sand's infatuation for Pagello and his happiness to think that one of his rather humble birth and lack of intellect should be noticed by the most celebrated woman in Europe; his desire to keep the liaison a secret lest it might affect his practice; the emancipated woman's public declaration of her infatuation by literally "hanging on his arm"; Pagello's father's interference and finally his approval; George Sand breaking the news to the doctor of her intention to return to Paris and issuing a half-hearted invitation for him to accompany her; his state of doubt and the last night in Venice, which was sleepless because of his unsettled mental state; his willingness to go and the sale of his valuables; their arrival in Paris; his disillusionment on account of being compelled to live in a garret, the novelist having left Paris to visit her children at La Châtre; walking the hospitals and pursuing his studies, with special attention to lithotrity; George Sand's desire to get rid of him; her purchase without his knowledge of the pictures, which he had brought from Venice but which had no intrinsic value, so that he could live decently and visit the hospitals; the purchase of surgical instruments with one of the instalments of 500 francs; his realization of the situation; and finally his return to Venice where he "eventually prospered, achieving a great reputation for his skill in lithotrity and long maintaining the silence which he had imposed on himself," to quote Francis Gribble, who has written a most interesting chapter on this subject in his book, "George Sand and Her Lovers."

Of course, what has just been written is merely offered as a suggestion; and while we feel that in a play of this sort the doctor would present a diametrically opposite picture from what is now popular on the stage, there would nevertheless be much to commend despite the absence of a puritanic moral tone, for the doctor would at least approach a human being and not be the bore he generally is when our dramatists put him on the stage and imagine they are creating flesh and blood.

P. S.

A NEW TREATMENT FOR OBESITY.

It would seem that the subject of how to reduce one's weight is one that will never lose its freshness, for no matter how many different treatments have already been advocated the latest is the one that has the greatest lure. Of course, no one wants to be fat; and though it has been the opinion in certain high literary circles that a character in a novel to be genial and amiable and happy-go-lucky must be fat, the prejudice against an accumulation of adipose tissue among all civilized folk is not to be routed by this small pat on the back administered by the novelist. Some amiable critics have contended that fat is dependent on the fashion of the hour, for as the styles in clothes change so do the figures and what was thought graceful, though fat, some years ago must to-day be lean. But even though we may be opposed to a firm belief in this contention, what cannot be denied is that if a doctor wants to secure a large clientele all he has to do is to make known among a certain number of his patients that he has the magic bottle or pill that will bring about the desired result. In a very short time his prosperity will increase and his reputation as a benefactor of mankind be established. It must be that man is bitterly opposed to obesity, even in a slight degree, otherwise there would not be in every community so many doctors who specialize 'in fat,' or the vast array of rules and regulations to ward off the enemy, which we see in our medical journals and also in those which are not medical. Fortunately, these rules and regulations are soon forgotten, for if they were not there would be no room for the new ones. Not that all the older ones were ineffective; but as regards a strict systematic method for the reduction of fat, it soon palls on the patient, and if the least bit encouraged by his doctor he will fly into the embrace of a newer method provided it is easier to follow. Therefore it is with a decided degree of pleasure that we announce Professor Bergonié's method* which has the advantage of no work for the patient and a very large breakfast early in the morning.

Fully aware that fat people are loath to exercise and undeceived by what they asseverate they have done in this respect, which in most cases is almost *nil*, the Bordeaux Professor has devised an electric bed for their convenience and causes the muscles to contract by means of "a rhythmically interrupted faradic current of low tension" with the result of achieving "strong, regular, and painless contractions. . . . The increased metabolism is shown by the quickening of the pulse and respiration rate, the skin becomes red, and perspiration may appear. . . . The circumfer-

*Lest some of our readers, who get all their cues from Germany, may think lightly of this method, we would advise them that Otto Simmonds (*Med. Klin.*, January 18th, 1914) has achieved gratifying results.

ence of the abdomen often diminishes much more rapidly than the loss of weight would seem to indicate. . . . After the individual application of the treatment there is no feeling of fatigue worth mentioning, the patients progressively improve in condition, and depression of spirits vanishes. The treatment can be applied locally to any part of the body."

But the most fascinating part of this treatment is the matter of meals. Who has not thought himself a man of great strength of character because he had the will power to follow his doctor's orders and eat no breakfast! What have not been the contemptuous remarks made by the followers of 'no breakfast' about the unenlightened ways of their brethren! But all this is to be changed from now on, for the 'no breakfast' enthusiast will no longer be hearkened to, which is very fortunate for he was getting to be quite a bore, since it is Professor Bergonié's teaching that breakfast at 7:30 a. m. will have to be the principal meal, whereas luncheon and the evening meal must be light.

Thus we see that things move in a circle and that that which was honored and then scorned has a fair chance of regaining its popularity, for again early in the morning, perhaps earlier than we would wish, the table will groan under the weight of fruit, cereal, steak, bacon and eggs, vegetables and all those other adornments which gladdened the American heart before the invasion of the Continental breakfast.

That Professor Bergonié is a student of human nature must be admitted by all, for, in the first place, he knows that no one really cares to exercise and, in the second, that nearly everyone is hungry in the morning. And perhaps his natural shrewdness has taught him how fickle the public is in regard to following a treatment that spells self-denial throughout, that makes people fearful on account of its very limited latitude, that soon becomes such a weight and such a destroyer of the joys of life that moroseness results. No doubt he has the proverbial Frenchman's happy disposition, a disposition that is so optimistic that it refuses to see others suffer, and no doubt he has seen the failures recorded against other treatments, not so much through any grave fault in the treatment itself, but rather on account of the swerving of the patient due to the impossibility of anyone but an abnormal being living up to his doctor's tenets. Hence it is our duty to be grateful to one who not only can reduce our weight by giving us the least possible annoyance, but is also so keen an observer of human nature that he wins us over to a proper appreciation of what constitutes a friend and benefactor.

P. S.

OPINION AND CRITICISM.

'TANGO-FOOT' AND THE AUTOMOBILE.

At first glance the reader no doubt will be surprised to see two such opposite subjects as 'Tango-Foot' and the automobile linked together in an editorial; but on closer view and assisted by the perspicacity with which the writer credits him, he will soon see that the connection is quite within the bounds of reason. Who has forgotten the anathemas which were launched against the motor-car when it insolently thrust itself into public view by speeding along our streets with a nonchalance that set the tender hearts of all the members of our various Humane Societies a flutter because of their love for the underfed and overworked horse and the knowledge that before long their arduous labors would have to cease on account of the scarcity of the equine! And who has forgotten the diatribes against the horseless vehicle by the medical scribes who saw not only a complete routing of our highly esteemed but never practised morals, but the 'automobile eye,' the 'automobile back,' the 'automobile palsy,' the 'automobile knee,' and a general nervous breakdown in every driver! But were these prognostications verified? was a greater deterioration of the race evident? were the cripples on the increase? and were our sanatoria overfilled? We think not; and though we are not within reach of statistics to verify our statement, we are prone to cling to our opinion because to-day nearly every doctor of repute in our democracy is driving his own machine—that is if he really wants the full benefit accruing from this 'sport'—and is still in a healthy condition as regards morals, knees, eyes and other dark and dismal prophecies. And after all this excitement passed away and we had composed ourselves for another spell of quiet existence, some wight brought into this country the Tango, and again the fires of controversy were relit and the scribes, both medical and lay, took up their pens and filled ream after ream of paper that might have served a better purpose. We were told that this dance is immoral, that certain 'refined' gentlemen who indulged in it had pains in their testicles and prostates, and we believed our medical authorities; but what we overlooked was that these same 'refined' gentlemen would have had the identical pains, and really had them, every time they were in close proximity with 'refined' ladies. But morals should not be too extensively exploited in a medical journal nor should too much space be allotted to the discussions of what causes testicular or prostatic pains; hence we will dismiss these inconveniences of the male Tango dancer and turn to what, from a medical standpoint, is more important, since it is a genuine affliction of both sexes and a very

painful one at that. Reference is here made to 'Tango-Foot' which has enlisted the attention of Dr. Gustav F. Boehme, of New York, to such an extent that he has contributed an article on the subject to the *Medical Record* of April 25th.

Without going into all the details of the latest inconvenience resulting from the Tango,—we would fain do so, since it is about the only decent inconvenience that has been mentioned up to date,—it is nevertheless necessary to enlighten the reader somewhat; and when we tell him that "in every instance [Dr. Boehme] has found the same symptom-complex—and on investigation discovered the cause constant—the modern dance," and that "the patient generally awakes in the morning with a slight dull pain in the outer anterior aspect of the leg in the lower third. At first it is regarded as a slight bruise or a 'little rheumatism.' During the next few days the pain becomes more marked and a stiffness in flexion and extension of the foot is noted. Going up and down-stairs is painful, especially the latter," the gravity of the case becomes apparent. But the degree of gravity is decidedly increased when we read further on that "the resultant (of the various intricate steps) is a constant strain on the extensor muscles of the foot, viz., the tibialis anticus, the extensor longus digitorum, and the extensor proprius hallucis, which in turn produces a tenosynovitis in this muscle group."

From the foregoing the reader can easily arrive at the conclusion that there is a close connection between the Tango and the automobile. Both have been severely criticised; both have had to pass through an intense fire of criticism; both have been the subject for thunderous moralizations and warnings of a medical nature. Fortunately, for the automobile, a degree of acceptance is now in the air; and if we write thus it is not on account of our prejudices for it, but because of an article, "The Automobile and the Public Health," which we have recently read in the *Popular Science Monthly* and in which the writer, Dr. P. G. Heinemann, exercises that degree of sanity that is beloved of all men who know that a screed is not of telling worth and a prejudice founded on mental shortsightedness not an exalted virtue. To quote: "A few considerations will make it apparent that horseless vehicles may bring about far-reaching betterment in human conditions. The enormous increase in the use of automobiles and autotrucks is bound to change some aspects of city life. There are possibly three directions in which the public health may be benefited, namely: (1) the improvement of streets and roads, resulting in reducing the amount of dust in the air, (2) the disappearance of the horse and horse stables from the neighborhood of human habitations and the consequent reduction of flies and (3) the avoidance of direct infections of stablemen and veterinarians, who come in contact with horses."

Will the Tango, as regards criticisms, ever leave its present morasses and get into a like pure atmosphere?

P. S.

LITERARY NOTE.

Scientific research has a past and because of this past investigators seek to present a maximum of data and a minimum of personal equation. It is interesting to see how Dr. Albert Abrams reverses the usual order, and his monograph on "Human Energy" is the more interesting because it refers copiously to his book on "Spondylotherapy," used as a text in chiropractic colleges. The author has discovered a stomach reflex which might well be named 'some reflex,' because it is so sensitive that the 'anthropodynamic' discharge liberated through the mere pointing of a finger will cause the stomach to shrink into its 'atmosphere of tympany.' The discharge is, however, subject to sex differences. The male must do the pointing with a finger of the right hand; the left is potent only in the female. This 'sex polarity' is well shown, although the author neglected to mention it, in the buttonholes on one's clothes: in the male they are on the left, in the female on the right. The sex polarity may however be entirely eliminated by painting the opposite 'psychomotor area' with some yellow material. This review cannot take up the elaborate details of this monograph, or expatiate on the technique of percussion which is very delicate—even more delicate than the electroscope, but rather look for the facts and not the metaphysics.

The author finds the lower border of the stomach as determined by its 'reflex' at a much lower level than the skiascopic views show to be normal for the erect posture. Then, too, the stomach is not a flaccid bag containing gas but is normal in tone with the gas bubble above the level of the esophageal opening. It may be that the transverse colon is masquerading as stomach under the veil of omentum, for the large intestine has been known to react to physical stimulation. The locations of the 'energy discharges,' particularly of the back region, show certain anatomical deficiencies which do not correlate well with the author's ultra-metaphysical exactness. In Fig. 8, we behold an individual with but ten ribs and a seventh cervical spine well below the upper limit of the scapula.

Naturally the sex question receives consideration, and the author naïvely painted the 'psychomotor areas' in two homosexual individuals yellow with the idea of reversing the poles, but with negative results. Although the child before puberty shows no sex polarity, he finds it possible to elicit a 'right-handed' stomach dulness through the pregnant woman if the child be female, and a 'left-handed' stomach dulness if the child is a male. He suggests that wearing some yellow material over the right 'psychomotor area' up to the fourth month *may* eventuate in male issue. This should be excellent news for stock breeders who have tried for centuries to eliminate the ubiquitous bull-calf. The only doubtful point would be in selecting the proper stomach from which to elicit the reflex necessary in determining the polarity of the cow.

The monograph is concluded with a table showing the stomach reflex and polarity in some thirty-three diseases, and throughout refers to the work on "Spondylotherapy" which might prove equally interesting reading. Fleiss, Swaboda, Weininger and others have tried in vain to bring metaphysical concepts of life to the front, and we doubt that Dr. Abrams, on the basis of his present work, will be any more successful.

ORIGINAL ARTICLES.

CURRENT DEVELOPMENTS AND PROBLEMS IN VACCINE THERAPY.

By A. PARKER HITCHENS, M. D., of Glenolden, Pa.

There is a growing feeling among the medical profession that vaccine therapy has reached a point where its value and its limitations may be clearly defined. Since the visit of Sir Almroth Wright, in the autumn of 1906, an increasing number of American physicians have taken up seriously the study of immunity and specific therapy, and have come to consider vaccines as their chief resource in the treatment of certain infectious diseases. A tentative classification of bacterial infections has been made as follows: (1) Those in which the vaccine treatment meets every requirement; (2) those in which its effects, while encouraging, are more or less uncertain; and (3) those in which it is of little or no value. As examples of these one may call attention to the dependence very generally placed upon staphylococcus vaccine in the treatment of boils, carbuncles, etc., to the favorable reports on the use of vaccines in typhoid fever and pneumonia, a use which is rapidly becoming the routine treatment, although the good results are not so uniform as could be wished; and finally, to the negative reports on the treatment of acute urethritis by gonococcus vaccine as generally applied.

The many theoretic objections to the use of vaccines therapeutically, heard until recently, were based upon the fear that the injections would merely 'add fuel to the fire.' Consequently the theories of Theobald Smith,¹ enunciated at a recent meeting of the Philadelphia Pathological Society, are both encouraging and refreshing. According to him, the difficulty of reproducing in laboratory animals the exact chronic infectious processes, that occur in man, is responsible for the inadequacy of current theories to explain the beneficial effects of vaccines in treatment.

It is the purpose of this paper to show that the limitations which at present characterize the treatment of infections by vaccines are not permanent, and that further investigations will result in a wide extension of their field of usefulness. To do this it is sufficient to discuss briefly the attempts being made to improve the antigen and

to call attention to some phases of the work which are in need of further development.

PREPARATION OF VACCINES.

Bacterial vaccines, as usually prepared, consist of bacteria grown upon the ordinary culture media, suspended in salt solution, sterilized by heat, and protected from contamination by a small percentage of a preservative. A variety of causes is advanced in explanation of failures that have followed their use; some of these rest on purely theoretical grounds, such as that which points to inefficiency of the vaccine itself, others doubtless reside in faulty mode of administration, the accuracy of diagnosis, and in neglect of the accessory measures which make for success in vaccine therapy.

Many efforts have been made to produce a more efficient vaccine. The general object of these researches may be summarized as follows:—

1. To obtain a purer antigen.
2. To obtain a vaccine which will cause a minimum of local and general reaction.
3. To obtain a vaccine which will render the subject immune within the shortest possible space of time.
4. To obtain the antigen in a state more readily available when brought in contact with the tissues.

Before the matter of dosage in vaccine therapy had been so well worked out by Wright, the doses used for immunization were enormous, and the local reaction that followed was frequently so intense that the use of bacterial vaccines was greatly hampered. With the use of smaller doses the local and general reactions have been brought down to a point which is almost negligible, but obviously a vaccine which will cause no reaction is preferable provided the immunizing response is at least equal to that of the vaccine prepared in the usual way.

Peptone-Free Media.—Some interesting observations made recently, apparently partly explain the reason for the tendency of a vaccine to cause reactions. It has been shown by Besredka,² Nicolle,³ Reichel and Harkins,⁴ and others, that the peptone in the culture media on which bacteria are grown will, under proper conditions, cause anaphylactic shock, while equal amounts of bacteria grown upon media without peptone have no such effect. This suggests that the local reaction is to a certain extent non-specific and dependent upon the peptone.

There are two methods by which peptone may be eliminated. The first is by the use of culture media containing no peptone. Many bacteria grow, for a few generations at least, as well upon such substrata as they do upon the standard media. The question that must be answered before bacteria so cultivated are to be used gen-

erally, is whether or not the antigenic property is interfered with in any way. A change should not be made until this doubt has been definitely removed, though it does not seem likely that any objection will be found.

Washed Bacteria.—The second way by which bacteria may be obtained free from peptone is by washing them in normal salt solution in a centrifuge. This method is not quite so simple as the one just mentioned. The manipulations necessitated by the repeated washings are such that they increase greatly the chances of contamination; and if such additions to the technical procedure can be avoided it is always advisable to do so. There is the further objection that we do not know exactly what part of the bacterial cell is washed away and what part remains. Possibly some of the antigen will be found dissolved or suspended in the wash water, although a sufficient quantity of antigenic substance may remain. The work of Roemer and others in the production of antipneumococcus serum apparently shows that the washing process does not remove any essential part of the bacterial cell. In the treatment of horses with bacteria for the production of therapeutic serums, enormous doses of washed bacteria may be given intravenously, whereas the animal would certainly be killed by the injection of much smaller doses of bacterial cultures containing peptone.

*Nucleo-Proteins.**—Efforts have been made with much success to obtain the intracellular substances and to isolate the bacterial nucleo-proteins. It will be remembered that MacFadyean⁵ froze the bacteria and ground them while they were held at a temperature far below the freezing point. By breaking them up in this way he hoped to free the intracellular substances. Among the first to attempt the purification of substances containing bacterial antigens were Lustig and Galeotti.⁶ They used nucleo-protein not only for the immunization of persons, but they prepared antisera for plague by the injection of large animals with such bacterial extracts. Rowland⁷ mixed bacteria with anhydrous sodium sulphate, and by repeated fusion and crystallization hoped to alter the permeability of the bacterial cell wall so that the nucleo-protein would pass through when the mixture was suspended in water. He found that nucleo-protein was extracted by this method. As a result of his experiments he says that it proved to be a highly efficient vaccine. Brooks⁸ prepared plague nucleo-protein in this way and showed that the opsonic index was increased by injections of the product. Shibayama⁹ tested plague nucleo-protein by injecting animals directly into the lung. His conclusions were that it seemed to confer

*Gideon Wells (Nucleo-proteins as Antigens, *Zeitschr. fuer Immunitaet.*, Vol. XIX, No. 5, pp. 599-601, 1913) has recently called attention to the fact that the so-called nucleo-proteins are merely extracts containing a variety of substances. The extract composition depends upon the method of extraction and purification. It is wrong to consider them nucleo-proteins.

little immunity, if any. The recent work of Wollstein¹⁰ which demonstrated that avirulent cultures would cause pneumonia if the lung tissues were injured slightly, indicates that such a method of testing is faulty. Tiberti¹¹ obtained good results from the use of a nucleo-protein extracted from the anthrax bacillus. He used a modification of the method of Lustig and Galeotti.

Autolyzed Bacteria.—Rosenow¹² has shown that when bacteria are suspended in saline solution the latter becomes very toxic as a result of autolysis. The acutely toxic substance appears in the solution at a definite time, depending upon the activity of the autolytic ferment and the rate at which the disintegration of the bacteria occurs. The streptococcus pyogenes, streptococcus mucosus, meningococcus, gonococcus, typhoid bacillus, colon bacillus, and spirillum of Metchnikoff autolyze in plain salt solution, but the staphylococcus aureus does not. The latter, however, autolyzes readily when treated with washed leucocytes or serum. These observations corroborate the claim of Vaughan that intracellular toxins do not exist preformed in organisms like the typhoid bacillus.* The experiments of Rosenow are of the greatest importance, and go far toward explaining the intimate mechanism of infection and immunity. In the case of the pneumococcus he has shown that the toxic autolysate is not necessary for the production of immunity, thus confirming the statement of Vaughan that the poisonous part has no relation to the antibodies which make the system refractory to disease. An advance will have been made in the method of preparing vaccinating substances if by autolysis we may be able to get rid of the poisonous part and obtain a purer antigen.

Vaughan's Split Products.—The work of Vaughan is too well known to need any special description here; his methods for the chemical splitting of the protein molecule into a poisonous and non-poisonous part are classical. Vaughan has stated that the poisonous part of the protein molecule is a poison and nothing but a poison, and he believes it should never be injected beneath the skin under any circumstances. This statement, based upon biochemical studies, may be interpreted to mean that the poisonous fraction takes no part in antibody formation and may add to the toxemia already present. The amount of the poisonous fraction in an ordinary dose of vaccine is not great, but if by its elimination we may reduce local and general reactions, one of the points sought will have been attained. The practical result may be to enable us to administer much larger doses of the antigen without fear of a negative phase.

Antigens.—Some of the bacterial antigens for use in the complement fixation test may prove efficient also as vaccines, though this is

*Pfeiffer (*Jahresbericht fuer Immunitaet.*, No. 6, p. 13, 1910) claims that they do exist preformed within the bacterial body and are set free upon the breaking up of the bacteria.

not necessarily the case, since it is probable that the combining substances of the antigen are chemically related to the lipoids, while the substances that have to do with the formation of antibodies are proteins.

Digested Bacteria.—Hirschfelder¹³ has prepared a vaccine by the partial digestion of the bacteria. He incubates the suspension in a weak alkaline solution of pancreatin for fifteen minutes, and then stops the digestion by the addition of acid. After digestion for the proper time the mixture is thrown upon a Pasteur filter and the filtrate alone is used. The clinical results from the use of a vaccine prepared in this way have been very encouraging. It must be said, however, that there are many features about such a method which might cause the product to vary greatly in composition. Under ideal conditions of temperature, alkalinity, etc., digestion might proceed rapidly, while under other conditions there might be very little chemical change. The by-products of digestion are not eliminated, and if the hydrolyzing process should reach certain stages, this point might be important, as it is well known that certain of the amino-acids are extremely poisonous. This vaccine belongs to the class thought to contain the antigen in a form more readily available for the tissue. Local and general reactions are greater as a rule than those following the ordinary vaccines which may be due to the presence of digestive products. One is forced to ask, Are not the profound reactions following the use of such vaccines largely responsible for clinical improvement in the condition under treatment? For instance, would not similar results follow the administration of a solution of peptone or some other non-specific substance that would cause so profound a reaction?

Some of these methods for obtaining a chemical product of the bacterial cell, which will represent its essential antibody producing qualities, are promising. It would appear that in some such process we are likely to find a practical method for the production of vaccines from sporogenic bacteria. In this connection the writer might mention that following the method of Rowland we have prepared a nucleo-protein from the anthrax bacillus, which has been used for the immunization of guinea-pigs, with interesting results.

Sensitized Vaccines.—Fostered chiefly by the French school, interest in sensitized vaccines is apparently increasing. In the earlier attempts to produce active immunity it was noted that if it should be possible to protect human beings against infectious diseases, some method must be adopted to reduce or avoid the severe local and general reactions following the injections of vaccinating material. We know now that these severe reactions followed injections chiefly because very much larger doses were used than necessary. The doses then used increased more or less the susceptibility of the experiment animals. Another serious factor was the time

which elapsed after injection of the vaccine until the maximum production of antibodies took place. One of the objections to vaccine treatment has been overcome by the use of more suitable doses. Experiments were begun as early as 1891 when Babes¹⁴ in a series of experiments undertook to find a method by which immunity to rabies might be obtained more quickly, especially for patients bitten about the face by rabid wolves. He mixed the blood of a highly refractory dog with an emulsion of street virus. In the only experiment reported at this time it was shown that some protection was afforded by the mixture, although the dog finally succumbed to rabies. Continuing work along this line, but using mixtures of diphtheria toxin and antitoxin, he says: "These experiments prove that the neutralized diphtheria virus instead of being inefficacious, although inoffensive, constitutes a powerful vaccine. In comparing its vaccinating effect with that of diphtheria virus it is shown that by this procedure one vaccinates in a manner just as certain as and more rapidly than by toxin alone. It should be remarked, however, that the state of resistance produced by the mixture of toxin and antitoxin is not very durable, because a guinea-pig which withstood two grams of strong toxin succumbed upon injecting it after six weeks again with two grams of toxin."

Lorenz, according to Gordon,¹⁵ was one of the first to use the combined method for immunization. In 1892 he made some observations along this line in hog erysipelas. Beinrowitch¹⁶ concluded that the aptitude to elaborate active immunity and the duration of immunity are in inverse ratio to the quantity of serum in the mixture. Calmette and Salimbeni¹⁷ reached the same conclusion with regard to plague immunity.

Madsen and Dreyer¹⁸ also made observations upon the vaccinating effect of mixtures of toxin and antitoxin. Sobernheim¹⁹ speaks of having used the simultaneous injection of anthrax vaccine and anti-anthrax serum.* For special reasons, he says this method was dropped.

It is probable that many other persons mixed immune serum and vaccine with the hope that the serum would confer immunity immediately while the vaccine would lengthen the refractory state. Theobald Smith,²⁰ working with diphtheria toxin-antitoxin mixtures, has shown that by varying the quantities of toxin and antitoxin one may obtain every grade of immunity between passive immunity of short duration by serum alone and active immunity of long duration obtained by toxin alone. If there is a great excess

*He calls attention in a footnote to his publications in the *Berliner klinische Wochenschrift*, No. 22, 1902, and the *Berliner klinische Wochenschrift*, No. 13, 1899, and *Zeitschrift fuer Hygiene*, Vol. 31, 1899. He says that Sclavo has attempted to claim this method as his own. (*Estr. dagli Atti della R Accadem. dei Fisiocrit*, Series IV, Vol. 15, 1903.)

of antitoxin, the toxin present does not affect the duration of immunity.

Since neither the antigen nor the immune serum could be standardized, it is likely that in earlier work mixtures were frequently made which were able to confer only passive immunity, and therefore the method seemed to have no advantage. It was a decided advance then when Besredka²¹ suggested the removal of the excess of serum by washing the sensitized bacteria in a centrifuge. Ehrlich and Morgenroth had shown that all cells, and especially all bacteria, placed in contact with their corresponding antibodies, fix the latter to the exclusion of all other substances contained in the serum, and after fixation it is impossible by simply washing to break up the union. As is well known, bacteria and other cells thus sensitized need only the addition of complement to bring about their disintegration; therefore when so treated they should in theory be more easily handled by the tissues, since the body contains available complement. The technique at present used in the Pasteur Institute for the preparation of sensitized vaccines as given by Alcock²² is as follows: "To a culture of twenty-four hours on agar medium without peptone is added 1 c.cm. of sterile 0.8 per cent. saline. The growth is emulsified, filtered through fine silk into a sterile centrifuge tube and $\frac{1}{2}$ c.cm. of antityphoid horse serum added.

"The mixture is left for twenty-four hours at laboratory temperature, which should not exceed 24° C. Sufficient sterile saline is then added and the mixture is centrifuged for five or six minutes. After removing the supernatant fluid, more saline is added and the mixture again centrifuged. Ten c.cm. of fresh saline are then added to the washed bacilli and 1 c.cm. of the emulsion is placed in ten tubes each containing 9 c.cm. of sterile saline. One-tenth of 1 c.cm. of the above test tube emulsion contains about 500,000,000 bacilli, and this number is recommended for the minimum adult dose. The method of preparation of the typhoid serum is described by Besredka in the *Annales de l'Institut Pasteur*, 1906. The sensitized bacilli stain well. They are regular in outline, but broader and apparently swollen."

Since the publication of this method by Besredka, it has been adopted by other workers for the preparation of various kinds of vaccine. Marie has had more success with rabies vaccine prepared after the method of Besredka than Babes had with his vaccines, which were merely mixtures of serum from highly immunized dog with street or fixed virus. Baldrey²³ has used a sensitized killed vaccine for the treatment of hemorrhagic septicemia in cattle. Sensitized vaccines are preferred, especially for use during an epidemic. The ordinary unsensitized vaccine injected into an infected animal, in the incubation period of the disease, is likely to hasten the death of the animal; or if infection is acquired during the negative phase,

the injection of vaccine appears to lower the natural resistance. Thus an exposed animal is more likely to contract the disease during this negative phase. The work of Meyer²⁴ upon sensitized tuberculins takes rank among the interesting developments in the therapy of tuberculosis.

Recently, living sensitized vaccines have been used for immunization against a variety of infectious diseases such as typhoid fever, Asiatic cholera, bubonic plague, etc. The results appear to have been entirely satisfactory.

Having in mind the results reported by Major Russell of the American Army, one is likely to demand evidence to prove that living sensitized bacilli are superior to typhoid vaccine prepared in the ordinary way. The possibility of producing typhoid carriers also immediately presents itself when the injection of living (even sensitized) typhoid bacilli is suggested, and until such a possibility has been disproved, the use of living vaccines should not be sanctioned. The living bacilli are capable of growth under favorable conditions, but the amboceptor which sensitizes them cannot propagate itself. It is conceivable that the property of producing immune bodies in a shorter time with which sensitized vaccines are credited might be taken advantage of by employing sensitized killed bacilli for the immunization of persons already exposed to infection. The recent epidemic, in the town of Troy, Pa., reported by Hunt,²⁵ is interesting in this connection. The entire population was suddenly exposed to infection and it was desirable to obtain immunity within the shortest possible space of time. The use of ordinary vaccine was followed by results which led Hunt to question its great value in this epidemic. Under such circumstances, immunity could possibly have been obtained more quickly by the use of a vaccine containing sensitized dead typhoid bacilli.

As bacteria sensitized by the serum of immunized horses are just as potent to produce sensitization to horse serum in the persons injected, it would appear advisable to use the serum of some other animal for their preparation. Goats or sheep would serve the purpose perfectly. For the preparation of small quantities, rabbits, of course, are satisfactory.

Another thought in connection with sensitized vaccines is to question even their theoretic necessity for treatment, especially in mild grades of infection and for chronic processes. It is believed that after infection has taken place the body contains specific amboceptors for the infecting bacteria, and a vaccine injected therapeutically will be sensitized by these amboceptors. This is probably true when the second and third doses of typhoid vaccine are injected prophylactically, as is evidenced by the changed reactivity of the body manifest after the second and subsequent injections of the typhoid protein. The improvement which follows in certain condi-

tions, within a very few hours after the injection of vaccines therapeutically, occurs within a time too short for antibody formation, according to the usual conception of this process.

In discussing various methods for the preparation of the vaccinating substance and attempting to evaluate them, we must avoid generalizations. It is probable that for some types of infections and in certain phases of them, sensitized vaccines will be found best, while for others those prepared by another method will possess greater value. It seems reasonable to admit the claim that sensitized vaccines are likely to be more prompt in their effect, and that the negative phase is much shorter. If this is true, a sensitized typhoid vaccine, as previously mentioned, would be preferred for fighting an epidemic. For the treatment of infections of a very severe type they may offer great advantages, but vaccines prepared by Wright's method are satisfactory for the treatment of mild staphylococcus infections and for the immunization of unexposed persons against typhoid fever and cholera.

AUTOSEROTHERAPY.

In the treatment of any pathological condition the question of diagnosis is always of most importance. Especially is this true in vaccine therapy. The chief point in favor of autoserotherapy is that the bacteriological diagnosis is made automatically or, in other words, the necessity for a diagnosis is avoided. Apparently the first to use autoserotherapeutic methods were Debove and Remond,²⁶ who in 1891 reinjected subcutaneously into a patient suffering with tuberculous peritonitis small doses of the ascitic fluid collected aseptically. From the temperature elevation following the injections, they concluded that the peritoneal exudate contained tuberculin and later used this method for treatment. Since then many medical writers have used autotherapy or autoserotherapy in different ways and for the treatment of many conditions, with varying results. With proper bacteriological control the method has much to recommend it, but the technique described by some physicians must certainly be condemned. Sputum, discharges, feces and urine are collected without particular care with regard to the avoidance of contamination from neighboring parts; they are received into vessels sterilized sometimes merely by boiling, and in such condition are allowed to stand for several hours—sometimes twelve or more; then they are filtered through a Berkefeld filter and the filtrate is injected immediately. Everyone who has worked with filters knows the difficulty of obtaining sterile filtrates and keeping them so even under the best laboratory conditions.

Autoserotherapeutic treatment cannot be taken seriously unless specimens are collected with every possible care, placed into properly sterilized vessels, and the filtrates made immediately, so that

no opportunity is given bacteria which have no relation to the infection time to develop and possibly elaborate harmful toxins. It would seem especially dangerous to use a filtrate from an infection in any way connected with the intestinal canal, as the presence of the tetanus bacillus might lead to the formation of a lethal quantity of toxin in the so-called autolyzed filtrate. The filtrate should not be injected under any circumstance until the absence of tetanus and other toxins has been demonstrated, and until the sterility of the filtrate has been ascertained by bacteriological control. The chief field of usefulness of autoserotherapy would seem to be in the treatment of infections not exposed to external contamination, such as empyema, peritonitis, deep abscesses, etc.

The administration by mouth of raw infectious material containing live germs of unknown varieties is obviously inexcusable. If the species of micro-organisms present has been determined, and one may feel certain that none of them is likely to do harm when taken into the mouth, oral administration might come into consideration, but only if we had no better methods.

Only a step away from autoserotherapy, as it is sometimes practised, is the careless so-called 'short method' for the preparation of autogenous vaccines. Bouillon or another fluid culture medium is inoculated with sputum or pus, or infectious material of some kind; this is incubated over night and used after no other treatment than shaking and heating to 60° C. for a short time. This procedure should be permitted only for cases demanding great haste, which are caused by a single bacterial species. Such may be blood cultures in septicemia, lung puncture cultures in pneumonia, etc. These cultures could be made into vaccines directly, provided, of course, they were uncontaminated. That by autotherapy methods the vaccine may contain bacterial derivatives that would not be included in a vaccine prepared by the ordinary methods, cannot be denied.

The most potent argument used in favor of autoserotherapeutic methods is that the filtrates represent all the essential elements of the disease, unharmed by exposure to unusual environment and with none of the bacteria lost by failure to grow upon unfavorable soil. The implied criticism of bacterial vaccines, as they are ordinarily prepared, is certainly justifiable. We know well that there are pathogenic bacteria which cannot be cultivated by methods known to us at present. The technique used in the best laboratories does not exhaust the possibilities of the knowledge we do possess. Even autogenous vaccines do not usually include bacteria which will grow on neither blood nor ascitic agar in an ordinary Petri dish or test tube. Anaërobic bacteria are practically always left out of account.

Anaërobic Bacteria.—The reasons for the neglect of anaërobic

bacteria are difficulty of isolation and growing in sufficient bulk to make a vaccine. This is true in spite of the innumerable easy methods which have been devised for growing anaërobic bacteria. It is also commonly though erroneously believed that anaërobic bacilli are nearly all sporogenic, and because the spores would not be killed at a temperature of 60° C. the resultant suspension would be dangerous, while a temperature sufficiently high to kill the spores would destroy the specific antigen. A final reason is the general ignorance concerning anaërobic bacteria and their relations to the various regional infections. We are more or less familiar with the tetanus bacillus, the bacillus of Rauschbrand, and the bacillus of malignant edema; and here our knowledge of anaërobes ends. These are all sporogenic: they produce more or less soluble toxin; and accordingly it is thought by some that the diseases they cause are not interesting from the standpoint of vaccine therapy and anaërobic bacteria, therefore may reasonably be neglected.

A very little investigation reveals the fact that this is not at all the true state of affairs. Several excellent monographs have appeared within the last few years upon the anaërobic bacteria, among which may be mentioned those of Jungano and Distaso²⁷ and von Hibler.²⁸ Jungano and Distaso describe ninety-three species of anaërobic bacilli, forty-six of which are non-sporogenic. Fifteen of the non-sporogenic anaërobes are virulent for laboratory animals and many of them have been isolated from regional infections of various types and sources. It cannot be doubted that some of the failures of vaccine therapy are due to the fact that the vaccine used does not represent all the bacteria responsible for the infection, and an important class of those commonly left out is the anaërobes.

Recent researches have demonstrated the presence of anaërobic bacteria in healthy cavities. In infectious conditions in many parts of the body, they are found frequently associated with aërobic micro-organisms, especially in fetid and gangrenous suppurations. It is to be hoped that future studies of mixed infections will take into account the anaërobic bacteria present.

Vaccines from Sporogenic Bacteria.—Systematic work upon the problem of obtaining the antigenic substances from sporogenic bacteria is needed. The efforts that have been made so far to use various bacterial derivatives as vaccines may be utilized as the basis for such work. Reference has been made above to some of these methods.

Regional Infections.—Studies of the bacterial species found in various parts of the healthy body show that each exposed region seems to offer soil peculiarly favorable to certain organisms. The number of species found in each locality is surprisingly small. For instance, the skin is exposed to every sort of infection, and yet if we scrub away the superficial layers we are usually able to obtain pure cultures of staphylococci.

A list containing less than a dozen names will comprise all the species found in over 90 per cent. of specimens obtained from the nose and throat; and yet these parts are open to the invasion of every form of bacterial life. Why a few classes survive while many others fail to gain a foothold is interesting matter for speculation. It seems probable that in some way there is a balance of action between the bacteria and the tissues, so that ordinarily neither greatly disturbs the other. But when through some unusual circumstance the tissue forces are hampered or weakened, the so-called normal bacteria may acquire added virulence and avert pathogenic activity. The vaccine treatment of such an infection becomes a more complex problem than that presented by a lesion beneath the skin where there is no opportunity for the introduction of complicating factors. In the first place, the diagnosis is made more difficult. If in every specimen collected there are found four or five different species, it is not possible to select one of these as the offending germ, disregarding the others. A second difficulty has been pointed out by Allen. At the time of the first examination, it is possible that the true infecting organism may not yet be 'in process of free discharge,' and so may escape detection until subsequent examinations. Even when repeated examination has revealed the identity of all the bacteria present, we can have no assurance that additions will not be made to the bacterial flora at any minute. As has been said above, we know that the number of the additions is limited and we know what they are likely to be. During the winter months especially, any member of the 'cold' group is likely to be acquired, and if single vaccines are used for each type the treatment might extend throughout the winter. Allen first called attention to this possibility, and showed that a patient immunized to acute catarrh caused by one of the bacteria common to this region, not only could, but actually did become infected subsequently by one of the others within two weeks.

Infectious conditions of the nose and throat are representative of infections in other exposed parts of the body. Inflammation initiated by the invasion of 'foreign' pathogenic bacteria is likely to be complicated by the 'normal' bacteria which are present at the time or which reach the part later and find a favorable substratum. The rational treatment of such infections by vaccines requires the use of suspensions containing not a single species, the selection of which, as has been shown already, would obviously be 'guess work,' but a mixture of all the germs taking part in the infection and also those which are likely to take part therein. To those who have paid little attention to the problems of the treatment of mixed infections in exposed regions, this statement may occasion surprise.

It has been objected that there would be such a long list of bacteria in the mixture that no cultivable species would be left out.

As has been said before, however, the list is very short and the number of different kinds is sufficiently small to make a mixed vaccine containing them all entirely practical. Another objection is that if a stock vaccine containing all the usual 'cold' bacteria, as Allen has called them, is at the disposal of the physician, he may fall into the habit of using it for all sorts of conditions and neglect to make or have made proper bacteriological diagnoses. In reply it may be asked if such diagnoses are frequently made at the present time. With the exception of the cases in which diphtheria is suspected, how common is it to seek laboratory aid for guidance in drug treatment? It is believed that contrary to the suggestion that proper diagnosis will be neglected, the contemplation of vaccine treatment will lead to a desire for greater accuracy than has been the rule heretofore. In order to avoid misunderstanding, the writer wishes to emphasize the fact that he is speaking of the common acute, subacute and chronic catarrhal conditions of the respiratory mucous membranes, and not of those infectious diseases of definite etiology or symptomatology, such as diphtheria or scarlet fever.

A third objection offered is that the cells locally will be overwhelmed by the great variety of antigens and will be unable to produce antibodies for all of them. Park injected mixtures of diphtheria and tetanus toxins into horses and found that some animals would produce antitoxin for one and not for the other. This observation has been used as an argument against the use of mixed vaccines. The conditions are not at all parallel. It is well known that not all horses will produce antitoxin; some horses which have failed to make diphtheria antitoxin may later become valuable producers of tetanus antitoxin and vice versa. Park's purpose in injecting a mixture of both toxins was to find out, in the shortest space of time, what animals were suitable for one treatment and what for the other. We can usually make every rabbit yield an amoceptor of some value, but it is only the exceptional animal which gives us a serum of very high hemolytic titre. In the administration of vaccines, we are not trying to force the person injected to produce large amounts of antibodies which may or may not be related to immunity; we are merely trying to increase his resistance to certain proteins. The antibodies formed for each species of bacterium in the vaccine may not be so great in amount when the mixture is used as when a single vaccine is injected. But it is believed that *some* increase in resistance to all the infecting bacteria is preferable to a high immunity index to one micro-organism of the mixture with *no* increase in resistance to all the others.

It is claimed that such mixed vaccines are hit or miss 'shot-gun' prescriptions and are therefore unscientific. It is necessary to differentiate between those in which there are definite reasons for the presence of each organism in the suspension, and in which the mix-

ture represents merely the combination against which increased resistance is desired in order that recovery may take place or immunity be secured, and those in the preparation of which more or less guess work has been substituted for careful research.

A second class of mixed vaccines which is entirely justified is exemplified by one containing the typhoid bacillus and the two paratyphoid bacilli—A and B. It has been variously estimated that from 3.5 per cent. to 10 per cent. of the cases diagnosed as typhoid fever are really paratyphoid infections. Typhoid and paratyphoid fevers are so similar in symptoms, location of lesion, mode of transmission, and in the tendency of patients to become carriers, that immunization against the three infections at the same time is unquestionably a rational procedure. Such a mixed vaccine was first suggested by Castellani²⁹ as far back as 1902. He demonstrated that by inoculating an animal with two different species of bacteria at the same time, the blood produced agglutinins and immune bodies for both, and that the amount of agglutinins and immune bodies for each germ was about the same as in the animals inoculated with one germ only. Since then he has continued his work along this line, and has made numerous observations with several mixed vaccines in man, of which the principal ones are typhoid, paratyphoid A and paratyphoid B, and also a mixture of typhoid and the two more common dysentery bacilli. He states that in countries where paratyphoid A and B are endemic as well as typhoid fever, a mixed vaccine—typhoid + paratyphoid A + paratyphoid B—should be used. Lyons³⁰ has reported upon the satisfactory use of a vaccine containing the typhoid bacillus and two paratyphoids. Clements and Galwey³¹ suggest that the time has come for the routine exhibition of a paratyphoid A emulsion in combination with *B. typhosus* with a view to the prophylactic inoculation against the two diseases which still are prevalent in India. Kazeshima³² has recently reported some experiments demonstrating the value of the mixed typhoid vaccine. In collaboration with Hansen³³ the writer has studied the effect of single and mixed typhoid vaccines upon rabbits, giving them three doses at ten-day intervals, and estimating the content of the blood-serum in agglutinins ten days after the last injection. This work has been repeated many times on account of great individual variations in the rabbits. It has been demonstrated that there is satisfactory antibody formation to each of the three antigens in the mixture. However, an average of the figures obtained shows slightly less typhoid agglutinin formation in the rabbits that received the mixture than in those which received typhoid vaccine alone.

Hunt has reported the successful use of a mixed typhoid vaccine (typhoid, paratyphoid A, paratyphoid B) in the course of an epidemic of typhoid fever. The entire population had been exposed

to infection and 4.86 per cent. of those inoculated came down with the disease subsequent to the administration of the first dose. Of those not inoculated, however, 11.14 per cent. succumbed to the infection.

There is a third reason for the use of mixed vaccines, that is, for immunization before operations. It is entirely rational to use a mixed vaccine containing the bacterial species most likely to cause infection of the wound or operative site. The results of surgical intervention for the treatment of suppurative processes about the nasal accessory sinuses or the mastoid cells are frequently vitiated by subsequent infection. The best results from vaccine injection may be expected under just such circumstances. With a high opsonic index, the mechanical irritation, resulting in acceleration of the blood-flow and the outpouring of blood from the incised surfaces, would create ideal conditions. Before abdominal operations, especially if infection is present, a mixed vaccine similar to that suggested by Van Cott³⁴ is indicated provided sufficient time may be allowed for its use. Finally, it is the opinion of the writer that the potentialities of vaccine therapy in typhoid fever will not have been exhausted until a mixed vaccine is used for treatment. This vaccine will contain the more important bacteria that must certainly play a part in the typhoid state, especially after the development of intestinal ulcers. It is inconceivable that the great number of pathogenic micro-organisms always present in the intestine could come into contact with the ulcerated surface without exerting some pathogenic influence.

GENERAL CONSIDERATIONS.

The chief impression we derive from a consideration of the various attempts to obtain more efficient vaccines is that bacteriologists, generally, are very active in this important field. Apparently their work is based upon the idea that to get better results in vaccine therapy it is necessary to obtain a more efficient antigenic substance. The results obtained with bacterial suspensions, as made by Wright, force us to wonder if work in vaccine therapy might not be more fruitful if the labor expended upon these efforts were diverted to slightly different channels.

In following the theories laid down by Wright, we have permitted ourselves to believe that the function of bacterial vaccines is so to act upon the tissues that specific bacteriotrophic substances will be formed. We believe that this is the true function of the vaccine and that it has no other function. We believe we can say positively that the Wright vaccines fulfil this function.

From observations upon the blood-serum constituents after the administration of vaccines, we have learned that specific anti-bacterial substances are always produced as a result of the injec-

tions. The specific antagonism of these new-formed substances and the constancy of their formation are attested by the perfect results of antityphoid vaccination. Finally, evidence that their formation never fails is given by studies upon anaphylaxis. It thus appears to be a very simple matter to produce specific antibodies. These specific antibodies act against bacteria—the bacteria which cause disease. Then it must be a simple matter to cure infectious disease? The rationale of treatment should be something like this: After the diagnosis is made, prepare the proper vaccine, inject the vaccine subcutaneously; specific antibodies are formed, these get into the blood and destroy or aid in the destruction of the infecting bacteria—and the disease is cured.

But it does not always happen like this, for the disease is not always cured. Where is the trouble? From the evidence noted above, we know that our story is sound up to the time of the entrance of antibodies into the blood-stream; so much is certain; therefore failure to cure must be due to something which comes after that.

The failure is explained by studies in the pathology and pathogenesis of infections. If destruction of bacteria were a corollary to the presence of antibodies in the blood and tissue juices, we should rarely have infectious diseases because there are potent antibacterial substances in the blood normally. We have infections, because under proper conditions pathogenic bacteria reaching the tissues are able to resist the action of the normal antibacterial substances. They do this in various ways—both by chemical and physical means. The chemical means are the toxins and other products of bacterial growth, partly formed by their own activity, partly by reactive changes in the tissues and fluids of the host. The mechanical means are the pathological changes—the qualitative and quantitative cellular rearrangement characteristic of the lesion. These means are utilized by the bacterium for its self-preservation.

To overcome the chemical defenses, various antitoxins and antisera have been devised, and these sera have been effective according to the importance of the chemical products of the bacteria in question. Toxin, for instance, is the most important product of the diphtheria bacillus—diphtheria antitoxin is valuable; toxin is an unimportant product of the typhoid bacillus—typhoid antisera are worthless. In vaccine therapy we cease to consider the unsolved problems of the relation of metabolic products of the bacteria to the affected cells, and deal only with the specific proteins of the micro-organisms themselves. Studies in anaphylaxis prove that when proteins are administered to an animal parenterally, substances are formed thereby, the function of which is to remove proteins of that particular kind. Therefore, when we inject vaccines that contain the essential proteins of the organism causing the infection, the chemical defenses of the infecting agent interfere in a minor way only in our successful treatment of the disease.

We have then narrowed down the causes for failure to the mechanical means of defense used by the bacteria which have gained a foothold in the tissues. Knowing this, we next inquire, how shall we get inside these defenses? The ability of the physician to answer this question successfully determines his skill as an immunizator. In some infections this is no problem at all. The defenses of the staphylococcus, for instance, are sufficient to enable it to overcome the normal antagonism of the body; but, so soon as these are reinforced by vaccination, cure follows. For infections caused by some bacteria, the location of the lesion determines the strength of the mechanical barrier. In the treatment of urethritis caused by the gonococcus, for instance, the barrier is apparently impassable, while arthritis caused by the same organism offers no problem whatever.

The most promising field of study for laboratory men and others interested in vaccine therapy at the present time is, in the writer's opinion, the relation of the infecting bacteria to the blood and lymph supply. We can get along with our simple bacterial suspensions; they will produce all the antibodies we need provided we can make these antibodies effective. The fruitful line of study for therapists, therefore, is not at present a matter of dosage and intervals between doses; these questions are of minor importance. The problem to which they should devote themselves concerns the possibility of bringing the antibodies, formed as a result of the injections, into contact with the infecting bacteria. We have had a sufficient number of contributions detailing the results of treatment by bacterial vaccines alone. We know that a certain percentage of the various types of infection are cured, a certain percentage are improved, and a certain percentage are not improved. The reason for the lack of improvement is not that specific antibodies are not formed; it is that they were not permitted to come into contact with the infecting bacteria.

The real problems of vaccine therapy at the present time are problems in hydraulics. What we need now is the therapeutic engineer. We know that a certain area contains substances which should be removed. We have a high pressure main containing fluids that will remove them if these fluids can be brought to bear upon the substances in question. We wish information upon the possibility of opening up our channels of irrigation so that we may effect the desired result. We need first a survey. How are the bacteria located with regard to the barriers surrounding them? what channels are available? how can we best make the channels serve our purpose? Wright³⁵ has already pointed out, in one of his most valuable chapters, a number of accessory methods of value to the immunizator. His suggestions concern chiefly the use of sodium citrate for increasing the fluidity of the blood, and physical and

mechanical contrivances for increasing the flow of blood through the infected part. The writer believes that everyone is familiar with this chapter, and that it is necessary to say no more about the various methods suggested and the reasons therefor.

Since the writer knows so little about pharmacodynamics, he can present his ideas in the matter of drug accessories only in the form of interrogations. Are there not materia medica preparations which, if properly used, would be of as much accessory value as the mechanical devices suggested by Wright and others? In the treatment of acne, for instance, would it not be possible by the use of small doses of certain drugs to cause a temporary flushing of the face which would be as effective as massage of the face at prescribed times? In infections of other organs, are there not remedies which will whip up the circulation locally by increasing the heart's action or by dilating the capillaries? In cases where the blood is stagnated, as in certain catarrhal conditions of the nose and throat, are there not drugs which either by removing the cause of the stagnation or by contracting the capillaries will renew the blood locally? At the time when the content of the blood in antibodies is greatest, cannot a temporary local congestion be caused by proper drug treatment resulting in a hypersecretion of mucus and outflow of lymph? The writer thinks there are such drugs, and that it is through studies along this line, in conjunction with a more practical knowledge of the intimate pathological changes in infections, that better results in vaccine therapy are to be obtained.

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INTERNAL SECRETIONS AND DENTAL CARIES, WITH SPECIAL REFERENCE TO THYROID INSUFFICIENCY.

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The Effect of 'Internal' Secretions.—The glands whose secretions may possibly influence the resistance of the tissues to caries are the thyroid, the pituitary and the thymus, and in each case it is deficiency which may be responsible for an increased susceptibility. It is possible that each of these glands pours into the blood stream certain substances, which influence lime salt metabolism and utilization, and which might be called 'osteo-genetic' or 'dento-genetic' hormones.

Thyroid Insufficiency.—Of recent years attention has been drawn by Dr. Leonard Williams* and others to the fact that calcium utilization in the body is intimately associated with the metabolism of the thyroid gland. It is supposed that the internal secretion of the thyroid acts as a lime salt fixative in the body and that when it is absent or deficient the formative organs or tissues are unable to utilize or to hold the salts present in the blood and so the bones and teeth do not calcify to the normal extent.

From clinical evidence the writer is inclined to think that there is an association between that condition seen in children which is now diagnosed as thyroid insufficiency and the presence of dental caries. This, however, is an exceedingly difficult matter to decide definitely; there are so many concomitant circumstances relating to habits and food which require to be considered and eliminated. Some writers on the subject would go obviously too far in attributing health or disease of the teeth entirely to the effect of the thyroid gland. H. E. Waller,** for instance, claims that by giving thyroid extract to a child who had very carious deciduous teeth, the condition of the first permanent molar and central incisor teeth was affected, and when they erupted they appeared "to be all that could be desired."

Such an argument is, of course, by itself open to objection, but in addition it is necessary to point out that at the age when the thyroid extract was given (six years) the crowns of the first permanent molars and central incisors were already completely formed.

**Medical Review*, May, 1910, and H. E. Waller, *Thyroid Therapy*, 1913.

**Op. Cit., p. 4.

This case would rather go to show that in spite of thyroid deficiency teeth can be well formed.

Effect of Thyroidectomy.—In order to obtain some precise data as to the possible effect on the teeth produced by loss of the internal secretion of the thyroid, thyroidectomy has been performed by the writer on a number of young rabbits. The results of this operation in rodents is admittedly various, some authorities stating that the animals survive, others that the effect is rapidly fatal. The writer's experience supports this; he only succeeded in getting one rabbit to live. The others (four) died within a week. The animal which survived was kept for over a year and then killed; it thrived well and was apparently perfectly healthy; post-mortem there was no trace of thyroid gland present.

Alimentary Absorption.—In order to ascertain to what extent any deficiency of osseous development might be due to deficient digestion or absorption in the intestines, the amounts of undigested starch and of calcium in the feces were estimated on several occasions and compared with that of normal control animals.

It was found that the amount of calcium in the feces of a thyroidectomized rabbit was slightly in excess of that in the controls, but that the starch was much better digested than normally. The average figures are as follow:—

	Calcium excreted in feces	Amount of starch undigested
Thyroidectomized animal.	1.168 per cent.	18.018 per cent.
Control.	634 per cent.	21.83 per cent.

The amount of starch undigested in the feces is decidedly low; the writer has not previously observed it in normal rabbits to be below 20 per cent. under any circumstances. This increased utilization of starch probably accounts for the animal's general fat condition.

The loss of calcium is considerably in excess of the normal, and it might be supposed that this would have a prejudicial effect upon the calcium content of the bones and teeth.

Composition of the Teeth After Thyroidectomy.—The teeth were to the naked eye well formed and normal, the only difference being that they were extremely white and quite devoid of that yellow staining and fine black deposit which is almost universally present on rodents' and other animals' teeth, and also in many cases on human teeth immune to caries. This particular form of black stain or deposit is not due to accidental staining by tobacco or foods, but is 'biochemical' in origin, being produced either by chromogenic bacteria or from hemoglobin. It is most commonly seen in the cervical region of teeth in children who are immune, or nearly so, and is not improbably allied to the dark coloration which almost invariably accompanies a spontaneous arrest of caries.

The *specific gravity of the teeth* was estimated by the pycnometer method and compared with that of similar teeth in controls. (The writer finds it necessary to use similar teeth since there is quite an appreciable difference between the incisor and molar teeth of the same animals, due most probably to the different proportionate amounts of enamel present in the two kinds of teeth.) In this case the molar teeth were used. The control teeth gave a specific gravity of 2.49, whilst those of the thyroidectomized animal gave a slightly lower figure, 2.46. This difference is not apparently great, but the writer has previously shown that the enamel of human teeth demonstrably different in several physical properties differs only to a similar degree in density.*

Analysis of Teeth.—Corresponding with the above the teeth of the thyroidectomized animal showed on analysis slightly less ash than the controls—namely, 79.16 per cent. and 80 per cent. respectively, that is the teeth after thyroidectomy contained .84 per cent. more organic matter than normal. The calcium in the teeth was estimated and showed that the ash of the thyroidectomized animal's teeth contained 2.1 per cent. less calcium than that from the control's teeth.

Effect on Salivary Secretion.—It might be thought on a priori grounds that the thyroid and the salivary glands would have something in common. Developmentally they both arise as diverticula from the mouth or oropharynx, and at first the thyroid has also a duct, the thyroglossal, which opens into the mouth (at the foramen cecum), and both may be associated with the utilization of lime salts. It has also been found that in monkeys after thyroidectomy the salivary glands swell up and contain an excess of mucin, but whether this effect is temporary or permanent the writer is unable to say. The saliva was, therefore, on seven different occasions obtained from the thyroidectomized and control rabbits by aspiration from the mouth for five minutes after the subcutaneous injection of pilocarpine (1 mgrm. per kilo.). The following are the results:—

	Average alkalinity of saliva per c.cm.	Alkalinity index*
Thyroidectomy rabbit.65	.336
Controls.85	.399

*Total amount of alkalinity per minute.

It is seen, therefore, that apparently thyroidectomy has somewhat reduced the output of alkaline salts from the salivary glands, and also that this is not made up for by any increase in quality of saliva as seen by the diminution in the index.

The amount of saliva obtainable per minute, however, was more

*Prevention of Dental Caries and Oral Sepsis, 2nd Edition, 1914.

variable in the thyroidectomized rabbit than in the controls, and was frequently slightly in excess of them. It cannot be claimed, however, that the effect is very considerable either in amount or alkalinity.

Of more interest, however, is the *calcium secretion* of the salivary glands, since it is the metabolism of calcium which the thyroid presumably more directly affects.

Saliva was obtained in a similar manner to the above and estimated volumetrically for calcium. The writer found that the saliva of the thyroidectomized rabbit contained slightly less calcium than the control—namely,

	Control	After thyroidectomy
Calcium percentage in saliva.....	.0220	.0206

That the salivary glands do, however, tend to show a correlated variation with the thyroid gland is supported by the fact that post-mortem the submaxillary salivary glands were found to be much below the normal in proportion to the weight of the animal; thus the average weight of submaxillary salivary glands in normal full-grown rabbits the writer has found to be .3473 grm. per kilo of body weight, whereas in the thyroidectomized rabbit it was only .2268 per kilo.

The above results may be tabulated as follow:—

	Control animal Per cent.	Thyroidectomized animal. Per cent.
Specific gravity of teeth.....	2.49	2.46
Composition of teeth:		
Mineral matter.....	80.00	79.16
Organic matter.....	20.00	20.84
Calcium in ash.....	40.00	37.21
Calcium in dried teeth.....	32.00	29.90
Excretion by feces:		
Calcium.....	.634	1.168
Starch.....	21.83	18.018
Salivary secretion:		
Alkalinity per c.cm.....	.85	.65
Alkalinity per minute*.....	.399	.336
Calcium.....	.0220	.0206
Weight of salivary glands per kilo of body weight.....	.3473	.2268

*In terms of $N_{50}NaOH$ for reasons for thus expressing alkalinity see author's "Prevention of Dental Caries," etc.

It is doubtful whether a definite conclusion can be drawn from the above investigation, seeing that only one animal was used. Also of course the animal showed no signs of myxedema. It is nevertheless to be observed that the variations in the thyroidectomized animal although slight are all in one direction—namely, in that which would *lower the resistance of the teeth to disease*. This coincides with clinical observations. The result therefore goes to

support the theory that thyroid insufficiency may favor the occurrence of caries of the teeth.

The Pituitary Gland.—As is well known the secretion of this gland has an influence upon the morphology of the jaws, excess of secretion leading to increased growth and deposit of bone (equals increased local fixation of lime salts), whilst probably a decrease leads to the condition called *progeria* in which the jaws remain infantile in character and growth, and local utilization of lime salts is defective. Professor Arthur Keith* has suggested that the internal secretion of the pituitary acts as a 'sensitizer' between the nerve fibrils and the functioning cells. That is to say it enables the neurotrophic influence to exert more readily a stimulating effect upon osteoblasts. But why should it be limited to osteoblasts? It is quite possible that ameloblasts may also be similarly affected, and, although the writer has no evidence for such a suggestion, it is worth enquiry as to whether pituitary deficiency may not be a contributing cause to the imperfectly 'finished' enamel prisms which Keith has shown to be commonly present on the surface of teeth susceptible to caries. This imperfect finish (never seen either in 'native' or European sclerotic teeth) consists in minute depressions at the ends of the prisms. This defect increases the adherence of foreign matter and exposes a larger and more vulnerable surface to the action of fermentation acids.

The Thymus Gland.—This gland, which in human beings is normally, of course, only a temporary organ, disappearing after infancy, has also been suggested as playing a part in the etiology of caries. Baoch** has found that in puppies osseous development is retarded by excision, but the writer is unable to say whether any effect was observed upon the teeth. If it does play a part it could only be in connection with the deciduous teeth.

CONCLUSION.

There is some reason to think that deficiencies of secretions of the thyroid and perhaps the pituitary and thymus glands may be concerned in the lowering of the resistance of the tissues to dental caries. It is necessary, however, to be careful of generalization—because thyroid insufficiency may be a causative factor in certain patients it does not follow, *ipso facto*, that it is *always* a cause of caries. There are very many other factors physiological and pathological also to be always taken into consideration.

**Dental Record*, p. 774, December 1st, 1913.

**Quoted by Dr. W. J. Gies (*Journ. Allied Dental Societies*, January, 1914).

GALL-BLADDER DYSPEPSIA.

By WILLIAM FITCH CHENEY, M. D., of San Francisco,Clinical Professor of Medicine, Stanford University Medical Department.

Six years ago the writer published a paper on the gastric neuroses,* based upon 375 cases in which this diagnosis had been made. With further experience since that time there still seems no good reason to doubt the occurrence of primary gastric neuroses, despite the tendency of the day to assume that such a thing does not exist. And yet it may readily be admitted now that the group is smaller than we used to think; for at that time the neuroses were set down as the largest with which we had to deal when considering the stomach and its disorders. There is no conclusion better proved during the past decade than that of the frequency with which the stomach makes complaint when the real disease exists in some other organ more or less remote. Much progress was made when the profession came to realize, for instance, how often chronic appendicitis forms the basis for gastric disturbance; and how the latter persists, in spite of all treatment to the stomach, until the diseased appendix is removed. More recently our attention has been called to the similar relation between gall-bladder disease and dyspepsia, and so persistently and by such high authority that there seems no reason to doubt it any longer.

For years it was taught that gall-stones might exist without producing any symptoms whatever. This old theory was based upon the frequent discovery at autopsy of gall-stones in patients who had no history to point to their presence. The fallacy in this argument was that the patients were dead when the gall-stones were found, and could not be questioned about symptoms that might have existed and that might have been due to gall-bladder disease. In recent years, however, when gall-stones have been found unexpectedly at abdominal operations, later questioning has often elicited a history of chronic dyspepsia which had not seemed to have any relation to the gall-bladder, but which disappeared after the operation. Moynihan,** in 1908, was one of the first to call attention to this, and to insist that gall-stones always cause symptoms, even though the latter are purely dyspeptic in character. He gave the name 'inaugural' to these symptoms, which in his opinion may persist for years before their real cause is recognized, either by the

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ultimate occurrence of an attack of biliary colic, or by an operation performed for suspected gastric disease. About this matter he says: "As soon as stones are once formed in the gall-bladder, symptoms begin to assert themselves; in medicine, fallacies die hard, but rarely is one so tenacious of life as that ancient fallacy which expresses the view that in a great majority of cases gall-stones do not give rise to symptoms."

Mayo* expresses himself no less positively. "Ten years ago," he says, "we heard a great deal about 'innocent gall-stones,' which meant that gall-stones existed without symptoms and that their presence was not suspected until post-mortem examinations brought them to light. We cannot now escape the conviction that the gall-stones did cause symptoms and that we as diagnosticians and not the gall-stones were 'innocent.'" And in the same article he states: "As regards the presence of gall-stones without symptoms, the symptoms may not be recognized as coming from gall-stones, but if gall-stones are accidentally found during the course of operation for other causes and the history is retaken in the light of these findings, it will usually be found that symptoms were present but were not differentiated from the symptoms of the disease for which the original operation was undertaken."

A third surgeon of large experience who calls attention to this matter is Deaver.** He says: "In contradistinction to the old view that most cases of gall-stones are without symptoms, we know now that all of them have symptoms and most of them very evident ones." All these men speak from the standpoint of actual observation of gall-bladder disease, apparently latent, but associated with stomach symptoms previously misinterpreted. Gradually, from their observations, it has become impressed upon diagnosticians that in any case of dyspepsia, without demonstrable evidence of organic disease in the stomach, the real organ involved and demanding treatment may be the gall-bladder.

Admitting this fact, we have next to ask the question, Is there any particular form of dyspepsia that we can recognize by its history or by physical or laboratory examination as secondary to gall-bladder disease? Many attempts have been made to establish a basis for identification, but so far none can be said to have proved reliable. Deaver, for instance, sums up the characteristic features of gall-bladder dyspepsia in the words "fair, fat, forty and belches gas," meaning that sex, obesity, age, and excessive flatulence are diagnostic features. Moynihan has attempted to describe certain characteristic 'inaugural symptoms,' such as fullness in the epigastrium after eating, relieved by belching, elicited especially by greasy foods, and dependent on the quality rather than the quantity of

**Journ. Amer. Med. Assoc.*, April 8th, 1911.

***Amer. Journ. Med. Sciences*, June, 1912.

food; a sensation of great tightness, which if unrelieved, may become acute pain, relieved by loosening all garments that fit tightly around the waist; frequently great complaint of acidity or heart-burn, or sour regurgitations; faintness, nausea, or rarely vomiting. But all these symptoms are clearly due at times to other causes than to gall-bladder disease and cannot be assumed to point infallibly to that as the proper point of attack.

The fact seems to be that numerous different and entirely opposite types of dyspepsia may be found associated with different cases of gall-stones, or cholecystitis. The three types most often met are (a) hyperchlorhydria, the clinical history resembling that of ulcer; (b) subacidity or achylia, the symptoms suggesting the possibility of cancer; and (c) disturbance of motility, with atony, myasthenia and food stasis. The most careful and painstaking history, and the most elaborate physical and chemical examinations of the stomach may reveal nothing except the proof that hyperchlorhydria, achylia, or myasthenia exists; and any further step in diagnosis must remain in these cases only a supposition, a possibility, an inference.

As regards the gall-bladder itself, in the group of cases under consideration, there may be no symptoms or signs whatever pointing to its involvement. No history can be elicited of pain in the gall-bladder area, or of attacks resembling those of biliary colic, or even of transitory or partial jaundice; and examination reveals no rigidity at the right costal margin, and no tenderness there either by ordinary palpation or by the Murphy manoeuvre. It is particularly in the absence of such evidence that diagnosis of gall-bladder disease as a cause of chronic dyspepsia becomes a surmise rather than a certainty. Illustrations of the difficulties met with will best emphasize our limitations in this matter.

CASE I.—A woman, *æt.* fifty, complained of annoyance by gas and sour stomach for twenty years; she had bloating and distress after every meal; her appetite was good but everything eaten seemed to sour and turn to gas; there was much belching and frequent sour eructations; occasional intense sick headaches, with profuse vomiting; pain in the stomach and through to the back on the left side, coming at variable intervals after food; for months past she regularly had induced vomiting or washed her stomach to secure relief. She was well-nourished, rather fat than thin; the stomach was dilated, prolapsed, atonic and splashing; after the test meal, total acidity was 96 and free HCl 69; blood was present both in stomach contents and in the feces. No abnormality was found elsewhere over the abdomen. At operation, recommended for ulcer of stomach, no ulcer was found; but the gall-bladder was thickened, adherent to duodenum, enormously dilated, containing an ounce of muddy bile, one large gall-stone and eighteen smaller ones.

CASE II.—A man, *æt.* fifty-three, always previously well, had been ailing about three months, with poor appetite, fullness and oppression soon after eating, much belching after meals, and loss of weight amounting to 20 lb. in the three months. The stomach contents showed much thick, ropy mucus, retained food particles, free and occult blood, but no free or combined hydrochloric acid. The abdominal examination was negative, not only as regards

the stomach but also in every other respect. The man did not improve on any treatment, but all his symptoms continued, including steady decrease in weight and loss in strength and color. Finally, at the exploratory operation advised for possible gastric cancer, no abnormality whatever was found about the stomach, but a large single gall-stone completely filling the gall-bladder.

CASE III.—A man, *æt.* fifty-four, had had stomach trouble for fifteen years, complaining that his food soured; he belched continually, had much pain during digestion and at times vomited very sour material. Examination showed that he had a dilated stomach, a marked peristaltic wave across it, much splashing, quantities of retained food, with a total acidity of 80, free HCl 40 and combined HCl 20. No sign of trouble could be found elsewhere over the abdomen. At operation for ulcer, the ulcer was found at the pylorus, partially obstructing, but the gall-bladder also contained one large single stone, the size of a pigeon's egg.

In all these cases the patients had persistent dyspepsia and also gall-stones; but how could the diagnostician reason from one to the other before operation? In other similar cases hereafter, when careful investigation has determined the exact condition of the stomach as regards size, tone, muscular power and secretion, can we possibly conclude that the dyspepsia, which constitutes the patient's complaint, is really due to gall-bladder disease? The writer feels very doubtful about the sufficiency of any diagnostic signs to point to such a goal, provided, as so often happens, that the only symptoms and signs are supplied by the stomach itself.

There is, however, another group of cases for which we must always be on the alert, where the manifestations are mixed, and are mainly those of dyspepsia as before cited, but interrupted at times by those of true biliary colic, though the latter attacks are often atypical and are likewise attributed to the stomach. Here the gastric symptoms and signs so predominate that the diagnostician's mind is distracted from all others and the gall-bladder evidences are overlooked. The narration of a case of this kind will best illustrate what is meant.

CASE IV.—A man, *æt.* fifty-five, complained of stomach trouble for years previous; appetite was good, but food caused distress, heaviness, fullness and belching almost at once after eating; sometimes this distress gradually became pain but never severe suffering; there was no nausea, vomiting or water-brash. Eight years before he had had a sudden attack of severe pain in the upper abdomen, and since then three similar attacks; the site of pain with these was the pit of the stomach, with radiation through to the back; in character it was very intense, colicky, spasmodic, the paroxysm lasting for several hours; during its persistence he perspired freely but never vomited; he never had been jaundiced following one of the attacks, but was always left sore and tender over the stomach. Finally, he had such an attack while under observation; his pain then was found to be to the right of the middle line; a chill preceded it and fever followed its onset, rising to 102.5° F.; the soreness and tenderness that ensued were found in the right side at the costal margin; following the attack his urine became very dark, his feces very light and his conjunctivæ decidedly yellow. The stomach was found to be atonic, dilated and hypersecreting, the total acidity being 68, the free HCl 40,

the combined HCl 16. It was clear that the dyspepsia was of the hyperchlorhydria type, but also that gall-stones were present as a probable cause. Finally, after months of observation and useless medical treatment the patient consented to operation. Many adhesions were found about the gall-bladder area, of liver to abdominal wall, gall-bladder to duodenum and to stomach, and one particularly strong adhesion between gall-bladder and duodenum, just beyond the pylorus, as if there might have been at some time perforation through by a stone, though no fistula was found; the gall-bladder when finally exposed was very white, tough and thick-walled, containing about fifteen stones of varying size and shape, old, hard, many-faceted and angular.

The recognition of these mixed cases is commonly a matter for elation; and we feel that in finding some tangible organic disease that can be removed by the surgeon, we are furnishing our patient with the cure for all his dyspeptic woes. But even the recognition is not always certain, and the findings at operation are not invariably those expected. Even the most skilled and experienced observers occasionally reach conclusions about the existence of gall-bladder disease and its relation to chronic dyspepsia that are not justified when the parts are exposed to view. The following case shows how easy it is to make unwarranted deductions of this sort.

CASE V.—A woman, *æt.* forty-four, complained of stomach trouble of nine months' duration, characterized by poor appetite, fullness and pressure after food, gradual loss of weight and strength; but no actual pain in the stomach, no nausea, no vomiting. For five years, more or less constantly, she had had a sore spot and a darting pain in her right side at the lower border of the ribs; and nine months previously, at the outset of her dyspepsia, she had had an acute attack of pain in this spot, followed by jaundice for several weeks; since then she had never been well. While under observation in the hospital, she had a similar attack of severe pain at the lower border of the ribs on the right side, with a sense of soreness and tightness there. She was obese, and showed great rigidity and tenderness over the gall-bladder area but not elsewhere over the abdomen. The stomach was dilated and hypersecreting, the total acidity being 70, the free HCl 30, the combined HCl 20. Operation was advised for gall-bladder dyspepsia. No trouble was found, however, either in gall-bladder or stomach, but an old chronic appendicitis with adhesions and concretions.

Thus we find ourselves in the following predicament: The dyspepsia due to gall-stones, if there are no accompanying symptoms or signs of gall-bladder disease, cannot be positively recognized until operation, which often has been recommended for a gastric condition that does not exist; while, on the other hand, even when there are symptoms and signs pointing with apparent certainty to the gall-bladder, the dyspepsia may be due to coincident gastric ulcer or to some disease located neither in the stomach nor gall-bladder. If the error were simply one of diagnosis, we might bear with our chagrin; but the more serious fact remains that our patients frequently continue to have their dyspepsia just as severely as before, even after gall-stones have been removed and the gall-

bladder drained. This is the most discouraging feature about the dyspepsia associated with gall-bladder disease and supposed to be due to it: that removal of one does not always bring about removal of the other. In the first case reported, where gall-stones were found unexpectedly at an operation advised for gastric ulcer, the patient had just the same symptoms and just as persistently after operation as before; she continued to complain of her stomach, though direct inspection had shown that no visible organic change existed there; and several months later again entered the hospital wards for treatment of her dyspepsia, just as she had at first. Likewise in Case IV the dyspepsia and the hyperchlorhydria have persisted ever since the operation and the removal of gall-stones, though several months have now elapsed; of course, the attacks of biliary colic have been removed from the list of complaints.

These cases reported herewith have been selected merely by way of illustration; but others in the writer's experience could be quoted, and other observers have from time to time called attention to the same thoughts herein expressed. Kaufman* suggests that the gastric neurosis may precede and the gall-bladder disease follow later as a result; hence, removal of the latter leaves the former still untouched. It seems possible that in the swing of the pendulum towards an organic basis for all types of dyspepsia, it has recently swung too far, and that there are cases of gastric neurosis which cannot be remedied by surgical reconstruction of abdominal viscera. No one will dispute the advisability of urging the removal of gall-stones that are causing definite recurring attacks of pain and consequent invalidism; but where the complaint is simply of dyspepsia, of whatever type, and only suspicion points to the gall-bladder as a possible cause, one should think twice before promising too much, for quite frequently the discovery and removal of the supposed cause does not remove the symptoms for which the patient sought advice. Even after operation resort has to be made at last to old-fashioned methods of treatment by diet, lavage, support of a weak abdominal wall by corsets or belts, with careful consideration of the patient's environment, work and mental state.

Finally it will be well to review the indications for operative interference in gall-bladder disease. *First*, when there are definite recurring attacks of biliary colic with its classical symptoms, now well understood, and where gall-stones can be diagnosed with comparative certainty, there can be no question about the propriety of removing the stones and draining the gall-bladder. *Second*, when the symptoms are mixed, largely those of gastric disease, but with intercurrent attacks of so-called 'gastralgia' followed by mild jaundice and tenderness over the gall-bladder area, operation is again justifiable as a probable cure for both sets of symptoms; but with

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the understanding that even though stones are found and removed and the gall-bladder drained, the stomach symptoms may persist in a most obstinate and disappointing way, though the attacks of biliary colic may no longer occur. *Third*, when a prolonged and persistent dyspepsia has been present for years in spite of treatment directed to the stomach, it is true that at times this will be found at operation to be associated with unsuspected gall-bladder disease; it is also true that at times the removal of gall-stones or draining of a chronically inflamed gall-bladder will be followed by a brilliant cure of the dyspepsia; but it is by no means certain that this will occur, and we have no means of knowing in advance what types of dyspepsia are really secondary to gall-bladder disease, or which are going to be cured by a surgical operation. Hence the lesson which this paper has been written to impress: We must not be too certain in advance that any chronic dyspepsia is really due to gall-bladder disease, or too confident that the discovery of gall-bladder disease and its removal by operation are going to cure the dyspepsia.

THE PRESENT STATUS OF THE TREATMENT OF PNEUMONIA.*

By ELSWORTH SMITH, A. M., M. D., of St. Louis,

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The brilliant achievements in the domain of immunity, resulting in most effective remedies for many of the infectious diseases, naturally fostered the hope that sooner or later there would be developed a serum or vaccine potent in the treatment of the important malady—pneumonia. And yet, although the ablest investigators have been steadily at work on this proposition ever since the introduction of the first serum by the Klemperer brothers in 1901, practical therapeutic results have been obtained only so recently that they are not entirely available for judgment. And the reason for the failure of the many efforts during all these years will become apparent when the following fundamental bacteriological laws are considered underlying the life history of the pathogenic organisms causative of the disease:—

1. Pneumonia can be produced by organisms other than the pneumococcus, such as the streptococcus and the influenza bacillus, etc.
2. The pneumococcus group itself consists of not less than sixty-two strains, most of which require specific serums for their destruction, no one serum being potent even for all the strains of one of the groups.
3. The toxin of pneumonia has never as yet been isolated, though it is known that it must be of an insoluble nature, therefore much more difficult to deal with from the standpoint of immunization than the soluble diphtheritic toxin, for instance.
4. Neufeld and his pupils have shown that a certain amount of serum in relation to body weight is required to protect, which amount protects against many times the lethal dose, but that a slightly less amount will not protect against a very small multiple of the lethal dose. Therefore, such a serum to be effective even against a very mild infection must be present in the body in a given concentration. This is called the threshold concentration. These observers reported that in man the curative dose should not be less than 75 c.cm. or even larger in cases coming under treatment

*Read before the St. Louis Medical Society, February 12th, 1914.

late. Before this observation of Neufeld, the serums were all given in doses too small.

5. Dochez has shown that there is a maximum degree of infection against which no amount of serum, however large, is able to protect; from which must be inferred that one of the factors of the protective mechanism must be supplied by the body tissues. This means that when the infection is very great a sufficient amount of serum may be administered, but that the body cannot react to a sufficient extent adequately to supply this second factor. This brings us back again to the old standpoint of the importance of the physiological resistance or natural immunity of the individual, and suggests the importance not only of the early administration of serum before the infection has overpowered such natural immunity, but of husbanding to the fullest extent said natural immunity by building up the patient's general resistance with the most careful and scientific hygienic measures, such as careful feeding, an abundance of fresh air, water, etc.

Theobald Smith* says that there are certain other conditions independent both of the pathogenic organism and host which play an important rôle and may be included under environment, such as seasons, restricted and special kinds of foods that lower resistance, strain due to bodily exertion, and exposure to cold, the latter producing congestions and lowering resistance locally. Such influences are really more important than the infecting micro-organisms. The mere presence of the organism is not enough, for the natural immunity must be first broken down by exposure, fatigue, hunger, exertion, etc.

What can we expect of serums and vaccines against such a disease? Can they counteract the depressing influences of environment? If pneumonia is amenable to the preventive vaccination, why is it not accomplished by the virus of the upper air-passages where it vegetates in the majority of persons? These questions remain to be answered.

The plane of the immunity of two individuals may be raised by vaccination, but it will be unequally so raised because it must be raised in proportion to the natural endowment of each for defense against the invading organisms.

After thus briefly considering the essential requirements in serums and vaccines, we may now proceed to see how those advocated for the treatment of pneumonia comply with the above requirements.

First of all, How do the serums meet these demands? As has been said, the first antipneumococcus serum was prepared by the Klemperer brothers in 1901, and since then the two most used

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serums have been those of Pane and Roemer. The former first prepared his serum from donkeys in 1898; the latter used a polyvalent serum first prepared under his direction by Merck in 1905. The results from the use of either of these serums has not been convincing.

In the matter of the mortality of pneumonia, Wells collected 465,400 cases in which the treatment was based on the older and more generally accepted methods, with 94,826 deaths, or a mortality of 20.4 per cent. Musser and Norris' tables give 43,455 cases with a mortality of 21.06 per cent.* It is apparent from this that the mortality in pneumonia cases, not treated by the newer biological products and when based on a sufficiently large number of cases to render the estimation of said mortality reliable, is not over 20 per cent., and this mortality obtained in the above manner must be the basis of all estimations for the new present-day methods of treatment.

According to Musser and Norris, Anders in 1904 collected 535 cases, 61 of which were treated with antidiphtheritic serum and 474 with antipneumococcic serum, with a mortality of 18.3 per cent. Since then, Paessler, Winkelinar and Leichtenstern have reported on 24, 16 and 4 cases treated with Roemer's serum with a joint death-rate of 25 per cent.

Tartaso has treated 25 cases with Pane's serum, with two deaths.

Wilson** reports 18 cases with Pane's serum, with 22.2 per cent. mortality. Tyler† collected 141 cases treated with antipneumococcic serum (kind not specified), with 14.18 per cent. mortality.

Recently Roemer†† has reported on 21 cases treated with a serum he himself had prepared, with a mortality of only 4.7 per cent. Geronne claims excellent results for the Neufeld-Haendel serum in 12 cases of pneumonia.

These, then, constitute the available statistics on the treatment of pneumonia by antipneumococcic serum. How do they comply with the requirements above alluded to? First of all, is the number of cases sufficient for a correct estimation of results? Surely not, for all the cases combined, without discrimination as to kind of serum used, only equal 784. Secondly, even assuming that the number of cases be sufficient, the mortality is practically not less than on the older plans of treatment. Thirdly, all the serums were used without any regard for the particular strain of the infecting organism in the patient, and hence may or may not be productive of definite immunity. But while the serums do not comply with the essential requirements thus outlined, all observers claim for them a beneficial influence on the symptoms, by way of reduction of

*Osler's Modern Medicine, p. 634.

***Journ. Amer. Med. Assoc.*, September, 1900.

†*Journ. Amer. Med. Assoc.*, June 1st, 1901.

††Roemer (*Med. Annals*, p. 397, 1913).

temperature, of nervous manifestations; and, in fine, a condition of well-being and general comfort.

The most promising work, however, that has yet been presented is that of Cole. He approaches the problem in a more scientific manner.

Neufeld had found that his serum, prepared by him by the immunization of a horse with a given race of pneumococci, was effective against the race of pneumococci used for immunization, and also against certain other races obtained from cases of pneumonia; but against still other races of typical pneumococci said serum was absolutely powerless. In order to overcome this difficulty, Neufeld had recourse to the preparation of a serum by the inoculation of different races of pneumococci, hoping thus to obtain a polyvalent serum effective against practically all the races likely to be encountered. To Cole this method seemed crude, and so he devised the following, carrying a little farther the work of Dochez. The pneumococci isolated from the cases which Cole studied, he divided into four groups. A serum produced by the injection of a race belonging to Group I had a specific action for all the members of Group I, but had not any effect on any of the other groups. Serum II behaved in like manner with Group II. Group III was the pneumococcus mucosus organism, with very large capsules; against this group no immune serum could be obtained. Group IV included all the organisms against which Serums I and II were not effective, and which did not belong either to Group III or Group IV. Animals could only be immunized against the single particular strain of this group used in the preparation of the serum, but not against any one of the other strains in this group or against any strain of the other three groups. Of course, against this group it was impossible to obtain an immunizing serum, as that would involve immunizing an animal against every race of the group; but in the treatment of pneumonia this fact is of no importance, as most patients infected by the organism of this group recover without any specific treatment. Therefore, practically Groups I and II are to be treated by Serums I and II, the appropriate serums for each of these two groups.

A culture is made from the blood and also from a portion of sputum coughed up from the lung, or if this is not obtainable, then from a needle inserted into the lung, a procedure apparently without danger. With the culture thus obtained the agglutination test is made at once. If the culture be not agglutinated by Serums I or II, then no treatment can be undertaken, but if organisms agglutinate either with Serum I or II, then appropriate treatment can be instituted at once, as we know that we are administering the specific serum for the organism involved in the case in question.

With this method Cole has treated 17 cases; of these, 14 belonged

to Group I; all recovered; and of the others belonging to Group II, one died. This number of cases is, of course, too small for conclusions, but, as he says, inasmuch as the mortality in Groups I and II is high without serum treatment, the results are rather encouraging. He also believes, for reasons that he promises to divulge later, that the action of antipneumococcus is antitoxic, though he admits that this point will never be finally settled until the pneumotoxin is isolated.

As to treatment with vaccines, this method, of course, is based on the old work of Jenner in smallpox. At first vaccines were used only in more or less chronic and localized infections, but later they were given in the acute infections.

The objections to the use of vaccines in the acute infections were, in a general way, (1) the danger of inducing the negative phase by overturning the delicate balance in this class of cases; (2) the inability of the commercial mixed stock vaccine to meet one of the essential requirements—namely, that of specificity for the particular organism producing the disease, and which applies especially to the pneumococcus with its many distinct strains. The latter objection can be avoided only by the use of the autogenous vaccine.

As regards the second objection, although some of the ordinary pyogenic organisms may be cultivated and a vaccine prepared within twenty-four hours, still the pneumococcus cannot so be prepared as to be available promptly enough in the form of an autogenous vaccine in cases of pneumonia.

In regard to results with the stock vaccines, Shaeffer's report on a modified vaccine is based on the observations that show that the growth of the invading organisms can be arrested by the use of products derived from their culture in artificial media. The preparations used are solutions in sterile water of the soluble substances produced by the organisms growing on suitable culture media. The mixed infection is made from a large variety of pathogenic growths other than, but always including, pneumococci. This basic mixed infection is modified by addition of an excess of the products of the specific organism when attainable, but in case it is not known, then the mixed infection vaccine is used alone. The dose is 10 c.cm. subcutaneously or intravenously. In 56 cases of pneumonia thus treated he had no deaths. Though the reactions were strong, he advises repetition of the injection every twenty-four hours for four days.

Raw, however, who probably has had wider experience with this mode of treatment than anyone else, working a year later, and having used vaccine in pneumonia in 207 cases in the last two years, considers it only a valuable aid but not a specific remedy. The death-rate of his series of cases is 16 per cent.

The most encouraging work in the treatment of pneumonia by

vaccines is that of Rosenow and Hektoen through the use of partially autolyzed pneumococci. Rosenow has shown that when virulent pneumococci are suspended in physiological salt solution, the substance or substances, on which resistance to phagocytosis and virulence depends, pass into solution. At a certain stage of autolysis the soluble part or virulin is highly toxic and has little immunizing action, while the insoluble remnants have well-marked antigenic properties and practically no toxic effects. The soluble toxic part has been found to interfere with the formation of antibodies. The protective value against experimental pneumococcus infection of detoxicated pneumococci has been found to be greater than that of killed pneumococci. The cases treated were divided into three classes: (1) 30 cases in the private practice of physicians, of which 3 died—cases with bad complications; (2) 35 cases uncontrolled in Cook County Hospital, with 9 deaths or 25.7 per cent.; (3) controlled group, which will be seen in tabulated form.

TABLE I.

Mortality in Pneumonia Before Introduction of Antipneumococcic Serums and Vaccines.

	No. Cases.	Observer.	Mortality.
	465,400	Wells	20.4 per cent.
	43,455	Musser and Norris	21.6 per cent.
Total	508,855		20.45 per cent.

Mortality in Cases Treated with Serums.

No. Cases.	Observer.	Treatment.	Mortality per cent.
535	Anders	61 with antidiphtheritic and 474 with antipneumococcic serum.	18.3
44	Paesslerer and Leichtenstern	Roemer's serum.	25.0
21	Roemer	Roemer's serum.	4.7
25	Tartaso	Pane's serum.	8.0
18	Wilson	Pane's serum.	22.2
141	Tyler	Antipneumococcic serum (kind not specified).	14.18

Total Number of Cases Reported, 784. Mortality, 17.3 per cent.

TABLE II.

Treatment of Pneumonia by Means of Specific Serums (Rufus Cole).

Table A—Classification of 74 Cases of Pneumonia.

Type of Organism.	Number of Cases.	Percentage.
1	35	47
2	13	18
3 (mucosus)	10	13
4 (heterogeneous)	16	22

Table B—Mortality.

Type of Organism.	Cases.	Deaths.	Percentage.
1	34	8	24
2	13	8	61
3	10	6	60
4	15	1	7
Total	72	23	32
Total Number of Cases Treated by Serum, 856		Total Deaths, 158	Total Mortality, 18.4

TABLE III.

Treatment of Pneumonia with Partially Autolyzed Pneumococci by E. C. Rosenow and L. Hektoen.

Table A—Death-rate in Treated and Untreated Cases by Years.

Year.	Treated.			Untreated.		
	Total No.	No. Died.	Death-rate Per cent.	Total No.	No. Died.	Death-rate Per cent.
1911	51	16	31	50	25	50
1912	46	11	24	48	15	31.2
1913	49	7	14.3	50	16	32.0
Total	146	34	23.3	148	56	37.8

Table B—Analysis of Results by Age Periods.

Decennial Periods.	Treated.			Untreated.		
	Total No.	No. Died.	Death-rate Per cent.	Total No.	No. Died.	Death-rate Per cent.
1-20	21	0	0	17	2	11.4
21-30	39	7	18	36	8	22.2
31-40	43	11	25.5	34	14	41.1
41-50	25	8	32.0	32	14	43.7
51-60	14	6	42.8	18	13	72.0
61-70	4	2	50.0	11	5	45.45
Total	146	34	23.3	148	56	37.8

Treatment of Pneumonia by Means of Vaccines.

No. Cases.	Observer.	Treatment.	Mortality.
207	Raw	Schaeffer's Method	16 per cent.
Total Number of Cases Treated by Vaccines, 356.	Total Number of Deaths, 66.		Mortality, 18.5 per cent.

The work of Cole is encouraging mainly because the serums he uses are specific for the definite strain of pneumococci producing the disease in each individual case treated.

The work of Rosenow is promising because while he does not use an autogenous vaccine, he nevertheless works with one where the toxicity for the patient has been reduced to the minimum. The work of both these men is too recent to judge of its efficiency; and so we stand to-day with the mortality of the disease as yet practically not reduced by the newer biological products from what it was under the older plans of treatment.

Therefore, it seems to the writer that though every encouragement and success should be granted bacteriology in the solution of this difficult problem, it is opportune to sound a definite warning against the indiscriminate use of the many biological products vaunted as cures in this most serious disease, but which do not comply with the requirements of the scientific laboratory, being simply combinations of poisonous organisms, made up on the shotgun basis and hoping to hit the bull's-eye with one of the multiple poisonous arrows. For as Stone says: "We should remember that bacterial vaccines are toxic products capable of good or harmful results, according to the method of use. It is safe to assert that it were better that we depend more on first hand information obtained by methods of (scientific) clinical and (laboratory) research and less on the advertisements of well-meaning manufacturers of biological products."

Practically, therefore, it would seem to the writer that the only serum and vaccine which we are justified in trying to-day are those of Cole and of Rosenow.

SOME COMMON FACIAL DEFORMITIES FROM AN ORTHODONTIC STANDPOINT.

By H. CARLYLE POLLOCK, D. D. S., of St. Louis.

The physical attraction as manifested in the human face has been the theme of poets in story and in song, and the inspiration to the artist. Formerly, the face of the classic mold was thought to be a gift from the gods, but since the birth and development of the science of orthodontia, which is a branch of dentistry, man has defied this tradition and is able to adjust the contour of the face in its true harmony.

It has been said by a great artist that things beautiful are things in place. The placing of the structures in and about the mouth in their proper relationship is the work of the orthodontist. Without surgical interference, operators are able to cause receding chins and protruding upper front teeth to grow into their normal position.

This is brought about by a combination of mechanical apparatus, which can be adjusted to a thousandth of an inch. Small platinum springs are adjusted to the mouth by means of the teeth and made to exert slow gentle pressure, which in turn causes the tissues to respond and to grow in the direction in which the pressure is applied. The physical contour of faces is thus rearranged by changing an unsightly mouth into one which is pleasing, by causing a receding chin to grow forward, which has been arrested in its development, or by retracting a lower jaw which has advanced forward in its growth, completely out of harmony with the remainder of the face.

Not so many years ago these deformities were accepted as a perversion of nature from which there could be no relief, and a child so afflicted was condemned to go through life with this distressing mark of abnormality upon the face. Fortunately in the present day these conditions are corrected absolutely (thanks to men who have the perseverance to develop all branches of science). In the era in which we now live, if a parent allows a child to grow to manhood or womanhood with these facial defects, it is because he is not sufficiently informed upon the subject, or is derelict in the discharge of his duty.

Case I illustrates a little girl afflicted with a condition commonly called 'squirrel mouth.' A plaster cast made of the interior of the mouth shows the upper teeth projecting an inch



Case I.—Protruding upper teeth with lack of development of mandible. Typical mouth-breather. Before correction.



Case I.—After correction. Formerly mouth-breather.



Case II.—Profile before correction. (Note lack of development between eyes and mouth.)



Case II.—Profile after correction.



Case II.—Plaster casts of mouth showing teeth and jaws before correction and after. (Note the response in growth of bone in maxilla.)



Case III.—Before correction.



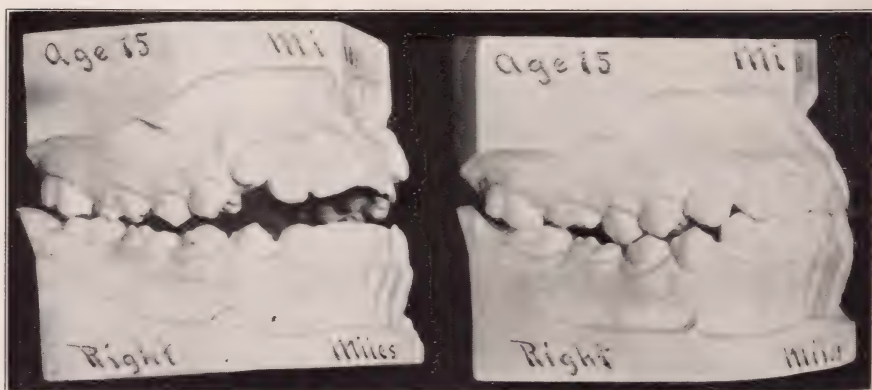
Case III.—After correction.



Case IV.—Caused by tongue habit.



Case IV.—Same corrected.



Case IV.—Plaster casts of teeth and jaws before and after correction (tongue habit).

in advance of the lower ones, which were responsible for considerable abnormal development about the mouth region. Orthodontia went to the rescue of this individual—the lower jaw was stressed against the upper one, and by slow gentle pressure was pulled imperceptibly forward. The active treatment required a number of months, but in the end a beautiful result was accomplished. At present, a firm and straight chin rests beneath the upper lip, and the girl is virtually equipped with a face in which the relative parts are in harmony.

As a contrast, the opposite variation from the normal occurs not infrequently (Cases II and III). In cases where the lower jaw protrudes in advance of the upper—the lower teeth being fixed in their position in front of the upper—the chin is thrust conspicuously forward and the face becomes malformed. Such was the type of condition presented by a patient (Case II) of Dr. A. H. Ketcham, of Denver. She would have been good-looking had it not been for the improper position of the teeth, which in turn were causing a deformity of the jaws. The process of masticating food with the teeth in this position had been going on for years, the results of which were obvious. This disfigurement was not accepted as a condition which could not be corrected. She applied for orthodontic treatment, and the upper teeth were slowly made to occupy a position outside the lower arch. This process required two years' time, periodic visits being made to the orthodontist. To-day her face has a pleasing expression, the opposite of the forbidding and harsh look before the correction was made.

Sometimes one encounters a really winsome face, with fine eyes and forehead, but the impression is ruined when once the mouth is opened and an array of irregular and over-crowded teeth are revealed. This condition is caused by the lack of development of the bony structure of the jaw. There is not sufficient size in the maxilla and mandible to afford places for all the teeth in their proper position. This condition invariably becomes exaggerated instead of remedied. Formerly, the only remedy would have been to extract a number of the teeth, though they might be perfectly sound, thus leaving the victim with an incomplete dental supply and its ensuing evils of malnutrition and indigestion, and usually a more unsightly mouth than existed before the teeth were extracted.

To-day, science undertakes no less striking a task than that of enlarging the jaws in order to afford space for the teeth. When one recalls that the jaws are based upon solid bone, the undertaking would at first glance seem to be formidable; but those engaged in this work have learned that by application of gentle pressure the bones may be called upon to respond. As the space is gained, the overlapping teeth are pressed back into their proper positions, and finally the patient, who formerly dreaded to expose the teeth, may

open the mouth and display symmetrical alignment. It is known to all how important a part the configuration of the jaws and teeth play in the symmetry of the face. The corners of the mouth, for instance, should be strongly supported by four canine teeth. It is a very common condition for these teeth to be out of alignment, and when in such position are commonly called 'tusks.' These teeth being the last to erupt (at about twelve years of age) cannot find sufficient room in the arch, so are forced to thrust themselves through the gum, above their contemporaries. The lines about the angles of the mouth are thus greatly distorted. The old process of extracting these 'tusks' left the angles of the mouth without support and caused deep lines to form early in life.

Parents of children are surprised when they learn of the cause



Case II.—At the present time.

of these conditions which are so common at the present day. The type characterized by receding chin and protruding upper front teeth can usually be traced to mouth-breathing, which is often caused by adenoid growths in the posterior portion of the nose. The constant breathing through the mouth by a growing child works havoc with the development of the jaws and teeth, and every means should be employed to stop this unless one is indifferent to the development of the child. It is easy for one with an experienced eye to spot the disaster worked in the eruption of teeth and the development of the jaws by mouth-breathing. This defect is so common that even one who is not experienced must have observed it on every hand.

There are other causes which might be mentioned. The nurs-

ing bottle is sometimes responsible for deficient growth. The jaws are robbed of the normal functional activity which they employ in natural nursing, consequently they do not profit by that rapid growth which is so manifest at the nursing period. Children often acquire the habit of thrusting the tongue between the teeth, which becomes the constant position for the tongue; as a consequence, the teeth are never permitted to grow together in the front of the mouth. The back molars may be in perfect contact, but a space exists in the biting portion just the size of the tongue (Case IV). In this type of case there is usually a lisping in the speech, as the tongue is unable to control the volume of air escaping between the front teeth. Sucking the thumb is a habit easily acquired by young children, and which gradually develops on account of the slow ideation of the child. You ask a question beyond the comprehension of the youngster; it hangs its head, puts its thumb in its mouth and digs its toe into the sand—solace of some kind is derived from the thumb being placed in the mouth. The child seems to like it, it seems to act as a mental placebo. Unconsciously the habit grows and, if persisted in, after a time a protrusion of the upper front teeth will be noted, and at the same time a retrusion of the lower. Fortunately, most children overcome this habit before a great deal of damage has been wrought, and nature is able to cope with the situation. If, however, the child does not desist from this practice, it may be necessary to resort to correction. There are numerous other causes of these deformities of more or less consequence, including injury; but after all, cases are occasionally seen in which the cause seems rather obscure, a fact that forces us to the conclusion that heredity must be reckoned with.

A California orthodontist reports having visited a tribe of American Indians, and while there having examined the teeth of many of them, and also studied their habits. Among them were very intelligent men, who believed in living the simple life, and whose diet consisted of very plain and coarse foods. He failed to find one case which needed any correction of the teeth and jaws. This report, in contrast to a report which might be compiled from our American cities, would afford food for thought to all observing people.

Alban Oppenheim, of Vienna, conducts experiments upon monkeys in which the jaws and teeth are shifted. Monkeys are used on account of the similarity of the dental apparatus to that of man. High chairs have been provided, and they are given the same painstaking care which is given to human beings. After sufficient time has elapsed for them to become accustomed to their new surroundings, they prove to be ideal patients, and seem to enjoy the activities of the clinic.

These tests have proved that Nature herself can be enlisted as

an ally in the treatment of these cases. It was shown that when pressure is applied to a bone, the little bone cells themselves set to work to manufacture the connective-tissue required for the increase in size, and will perform the task if granted sufficient time. If it be required to pull a chin forward, Nature may be depended upon to perform the task, if slowly and gently stimulated to cellular activity.

Having performed many creditable corrections, practitioners are now giving their attention to the more important field of prevention. One experienced in the growth and development of these cases is able to recognize "the handwriting on the wall," and arrest the defects in the early stages of development.

Nature makes a heroic effort to develop all parts of the human body to its normal state, and succeeds in her efforts unless thwarted by some influence which is beyond her control, or a force which she cannot conquer. She is able to overcome disease and build sound structures on insecure foundation in many instances, but we know there is a limit to her possibilities. If a foreign influence has interfered with the normal activities of Nature, fortunately science has made it possible for the hand of man to enter into the argument and assist Nature once more to gain her foothold upon the right track. This intricate phenomenon, Nature, once set in motion, and all things being equal, indicates the highest type of efficiency, and the skill of man can be utilized only as her assistant.

A plant that is set out to grow and is given no further attention is compelled to battle with the elements and other foes; it does the best it can; but with careful husbandry its growth is often phenomenal. A child, who grows to adolescence without the benefit of scientific cooperation in case Nature has been thwarted in her efforts, must battle in a similar manner, and only when there is the husbandry which science offers are the results outstanding.

REPORT OF A CASE OF BULLET WOUND OF THE FRONTAL SINUS AND BRAIN.

By GEORGE W. MACKENZIE, M. D., of Philadelphia.

H. J. S., male, *æt.* forty-seven, native of the United States, occupation, steam-fitter, was admitted, September 15th, 1913, to the Accident Ward of the West Philadelphia Hom. Hospital, with a history of bullet wound of the forehead. How it was inflicted and at what range are, at this writing, enigmatical.



Fig. 1.—Skiagraph taken before the operation, showing the location of the bullet which had settled to a point about half an inch lower than its original point of entrance.

Examination of the patient revealed the following facts: The patient was a middle-aged man of about 140 lb. He was fully conscious, but seemed morose and non-communicative. This prevented us from obtaining the full details of the occurrence. Upon removing the temporary dressings, there was found to be a more or less rounded, slightly depressed wound, about the size of the end of the little finger, located about 1 in. above the root of the nose, and slightly to the right of the median line. The wound showed but

little tendency to bleed. There was a suggestion of air-bubbles in the bottom of the cavity and a diffuse swelling about the root of the nose, together with tenderness and slight bleeding from the nose and throat.

As a skiagraph made by Dr. W. R. Pierce showed the exact situation of the bullet, it was decided that probing was unnecessary, but that a radical operation for the removal of the bullet was indicated.

A further examination showed the pupils to be of equal size and to react promptly to light, accommodation and convergence. The eyes moved well and together in all directions. Convergence normal. Vision of both eyes good. The ocular fundi normal. There

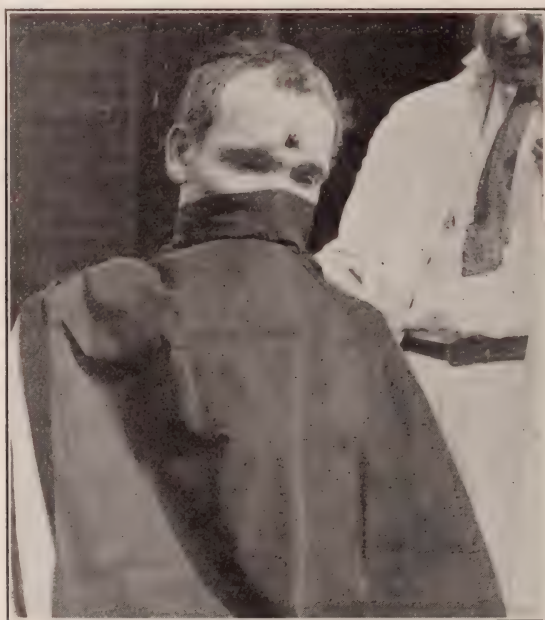


Fig. 2.—Photograph taken on the day patient was discharged, showing the depressed scar.

was neither anesthesia nor analgesia in the distribution of the fifth nerve. The patient could close the eyes, pucker the lips, and wrinkle the brow. There was impacted cerumen in both ears; after its removal the hearing was normal. Taste was also normal, and the patient swallowed water in a normal manner. The pulse was 120, and of good volume. Could move all his members well. Superficial and deep reflexes were also normal.

The patient was operated the following day, under ether narcosis. A horizontal incision, about 5 cm. in length, was made from the crest of one brow to that of the other, through the soft parts and the periosteum, down to the bone. A second incision extended, from a point at about the middle of the first, vertically upward for about

3 cm., making two right-angled flaps. Elevation of the periosteum and soft tissues exposed the wound and the bone about the wound for an area of 6 sq. cm. Close inspection revealed a punched-out hole, resembling a small trephine opening into which one could introduce the tip of the little finger. In the depths of the wound could be seen a disc-shaped fragment of loose bone.

The external opening was enlarged with bone-cutting forceps to about the size of a quarter of a dollar. An attempt was then made to remove the disc of bone, but without success, because its diameter exceeded that of the opening. The opening was then enlarged still further, until about the size of half a dollar, when the disc-shaped bone was removed without difficulty. Examination of this fragment showed that the part corresponding to the anterior surface of the skull was of about the size of a dime. The edge was bevelled in such a way that the posterior surface of the fragment was considerably larger than its anterior surface, being equal in size to a quarter of a dollar.



Fig. 3.—Photograph of the bullet and a chip of it. Natural size.

Behind this disc-shaped fragment could be seen the black, somewhat shiny bullet, at a lower level than the disc of bone referred to, and somewhat nearer to the ostium of the frontal sinus. At about this stage of the operation, air-bubbles and blood-tinged mucus were noticed coming up from the nose. Several small, splintered fragments of bullet and bone were removed, after which the bullet mass was grasped and removed with very little difficulty.

The bullet was found to be mushroomed. The side presenting inward was flattened considerably. The inner wall of the frontal sinus was found to be fractured, the splinters presenting inward toward the brain. Two spicules of bone, half an inch in length, had penetrated the dura and were buried to about a corresponding depth in the brain substance. These were removed with but slight, if any, loss of brain substance.

Two or three stitches were taken to close the wound partially. Iodoform gauze was then packed into the wound cavity, and loose sterile gauze dressings and bandage applied.

The patient slept fairly well that night; and on the following day, his temperature was 99.2° F., pulse 72, respirations 22. For the next four days, he felt fairly comfortable, his temperature coming down to normal. On the fifth day after the operation, he was put on full diet. On the sixth day, the wound was redressed, and was found to be clean and granulating normally. Redressings were made daily after this.

The patient continued to feel comfortable until the 29th day of September (the twelfth day after the operation), when, having slept very little during the previous night, he complained of severe pain in the head. The temperature was 99.2° F., pulse 72, and respirations 24. The wound was redressed, and found clean and healthy-looking. At 6:30 that evening, his temperature had returned to normal. On the following day, he complained of slight pain in the head. A thick, light yellowish discharge was seen coming from the wound when the redressing was made, but the temperature was still normal, and continued so. On October 13th, he had frontal headache and pain in the limbs, which continued throughout the day. His face was flushed, and the temperature at 6:30 that evening was 99° F., the pulse being 88, and the respiration 22. By the next day, however, most of these symptoms had disappeared. The patient's recovery, from then on, was uneventful. He was discharged on the 23rd of October, with a normal temperature and healed wound.

At this time a photograph was made that showed the wound completely healed, leaving a depressed scar about half an inch deep.

TENDON REFLEXES AND BONE REFLEXES.*

By DR. J. BABINSKI, of Paris,

Lectures delivered at the Hospital de la Pitié, reported by Drs. Albert Charpentier and J. Jarkowski, and reviewed by the author.

(Translated, with some additions in brackets, by
CHARLES GILBERT CHADDOCK, M. D., of St. Louis.)

Surreflexivity.—In general the tendon and bone reflexes are exaggerated under the influence of lesions of the pyramidal system seated above their centres.

Characteristics Which Permit Recognition of Surreflexivity.—(Causes of error of appreciation.) In considering irreflexivity, I emphasized the fact that voluntary movements might mask this pathological condition. Voluntary movements may cause an error of an opposite character, and lead to the assumption of the existence of a pathological state of surreflexivity from the tendons in a subject whose reflexes are normal. We must know how to avoid this mistake. I have already indicated the means of distinguishing contractions due to an act of the will from those of tendon-reflex origin.

It is a much more delicate matter to fix the limits of the normal state. I have already said that, with respect of intensity, the tendon reflexes present in normal persons great individual differences: moderate or weak in some, they are lively in others.** It is therefore necessary to determine the characteristics which permit the differentiation of reflexes that are simply lively, but still physiological, from 'exaggerated,' or pathological reflexes. To be sure, between lively reflexes and exaggerated reflexes, there exist transitions, and it may be difficult in a given case to affirm that the frontier of the normal state has been passed. However, I think that an experienced observer will usually succeed in solving the problem.

It is necessary to keep in view two orders of facts: (1) The tendon reflexes, while lively on both sides, are livelier on one side than on the other.

By virtue of the law of symmetry we say that this is manifestly an abnormal state; and reasoning as was done with reference to

*Continued from the February issue.

**Some writers employ without distinction the two terms—lively reflexes, exaggerated reflexes—a practice which leads to confusion. The word *exaggerated* should be limited in application to a pathological state.

unilateral subreflectivity, we add that there is every reason to admit, not an enfeeblement on one side, but an exaggeration on the side where the reflexes are the livelier.

(2) The reflexes are equal and very lively on both sides. Remark that though symmetry in subreflectivity is rare, it is common in surrefectivity. In fact this is seen in a large number of cases of diseases of the cord.

Aside from the impression one may have as the basis of judgment, there is a general criterion which I will state as follows: There is surrefectivity when, the subject making no voluntary contraction of his muscles, excitation of a tendon causes in the corresponding group of muscles, a series of rhythmical reflex contractions.

This feature, the absence of which, of course, does not exclude the possibility of surrefectivity, is especially apparent in the phenomenon called by [French] clinicians 'spinal epilepsy,' and which is most often observed in the foot. It is therefore called 'foot-clonus' [ankle-clonus] and 'epileptoid trepidation of the foot.' We test for this sign as follows: Holding the limb immobile in the left hand, and grasping the extremity of the foot in the right hand, the observer suddenly bends the foot upward on the leg [over-extension] while maintaining upward pressure. There exists epileptoid trepidation when this impulsion causes a rapid succession of movements of flexion and extension, giving to the sustaining hand on the foot the sensation of a perfect rhythm.

This phenomenon can be easily distinguished from false trepidation, which is a simple tremor, whose oscillations are less regular, and to which I shall return when I consider hysteria.

Foot-clonus, as follows from what has gone before, is a criterion of surrefectivity only when it fulfils the following condition: the clonus must be obtained with absence of all voluntary contraction of the muscles of the leg; then only is one justified in regarding the trepidation as perfect and denoting a pathological state. Otherwise, one may have to do with a form of trepidation that I have called *fruste*,* a common phenomenon observed in subjects in whom there is every reason to regard the nervous system as absolutely normal.

To convince oneself of this, it is only necessary to choose a few individuals presenting no sign of nervous disease, but who have lively tendon reflexes, and in whom the passive elevation of the foot, without any previous manipulation, has induced no trepidation. Then, in such subjects, the examiner directs that an effort be made to extend [flex] the foot on the leg and thus to resist a bit the

*De l'épilepsie spinale fruste, par J. Babinski, *Revue neurologique*, p. 111, 1903, et p. 287, 1906. [The French word *fruste* is derived from the Italian word *frusto* meaning partly obliterated, hence, by opposition, but partially finished, rough; medically it seems to mean incomplete in the sense of atypical.]

examiner's efforts to press the foot upward in his attempt to bring out foot-clonus. By such a procedure, one obtains in quite a large number of persons a trepidation identical in form with that due to a pathological state. I would have you note that this phenomenon does not always immediately develop with the first voluntary contraction; this must be made with a certain measured force. If the contraction is too strong or too weak, the clonus does not appear. It thus happens that an individual, on whom this experiment is made for the first time, has to make several graduated efforts before finding the suitable degree of resistive force necessary; after several trials he succeeds more readily, and then the trepidation resembles still more closely perfect foot-clonus. Nevertheless, in these various cases, it is very easy to recognize that one has to do with the *fruste* form of 'spinal epilepsy'; for, in fact, one is dealing with persons lending themselves to examination, and who, when required, relax their muscles, in which condition the epileptoid trepidation can no longer be provoked.

But let us admit that such a subject after exercise and training, so to speak, were to attempt to simulate foot-clonus, have we any means of recognizing the *fruste* nature of his trepidation? Assuredly, for it is very difficult or even impossible to maintain voluntarily, for several minutes consecutively, the muscles in the degree of contraction necessary, and therefore the trepidation would not present the same degree of constancy as in perfect 'spinal epilepsy.' I add that voluntary contractions rather interfere with than facilitate the manifestation of perfect trepidation, which is thus another means of differentiating it from *fruste* trepidation.*

It is none the less true, however, that if one does not give close attention, if, as many physicians do, one is satisfied with a rapid exploration, then one is in danger of mistaking one of these two

*[In some instances, as Babinski has elsewhere insisted, ankle-tremor and true ankle-clonus are readily distinguished by the persistence of the movement after cessation of the exciting and sustaining upward pressure. This is in accord with Babinski's contention of voluntary contraction as the essential element in the phenomenon of false foot-clonus. Frequently, false foot-clonus is perfectly rhythmical and continuous so for a prolonged period of its excitation, but usually the rhythm in this form is *very much more rapid* than that observed in true foot-clonus. I have recently noted a means by which, in some cases, the differentiation of false and true foot-clonus may be made: While one hand of the examiner performs the exciting rôle in the procedure, the other sustains the limb with the calf-muscles in its palm. Thus the active or passive state of these muscles can be judged. For example, in a certain case thought to have double ankle-clonus, I found a perfectly rhythmical but very rapid clonus on both sides, which immediately ceased when upward pressure was interrupted, and began immediately when pressure was again made. When this manipulation was done with the left hand grasping lightly the calf-muscles, it was noted that a rapid vibratory contraction continued in these muscles after upward pressure had been suspended—a fine vibratory (tremulous) contraction, insufficient to cause movements of the foot but readily appreciable to touch. The tremor in this case appeared only during manipulation, and there was none elsewhere. Tremors of this kind present no likeness to the spontaneous clonic movements (reflex of defense) so annoying to some sufferers with chronic spinal lesions.]

varieties of foot-clonus for the other. And still it is essential to distinguish them, I repeat, for perfect epileptoid trepidation is a pathological phenomenon, while the *fruste* form may exist in a physiological state.

It is well to remember that the *fruste* form of epileptoid trepidation is seen quite often in the tuberculous, who, otherwise, present no sign of organic disease of the nervous system.

If I have seemed to enter into a very circumstantial discussion of this subject, I have done so because it seems to me to be of great practical importance; because it is still imperfectly known by many physicians; and because this imperfect knowledge explains, as we shall see later, the divergence of opinions concerning the significance of foot-clonus.

Besides trepidation of the foot, identical phenomena are observed in other parts of the limbs. Thus by pushing the patella with force downward toward the foot [with the limb fully extended] sometimes successive contractions of the quadriceps are obtained which cause 'the dance of the patella.' Likewise, by forcibly pressing the hand backward, in certain cases, there occurs a series of jerks identical in nature with those of foot-clonus, called 'epileptoid trepidation of the hand' [wrist-clonus], described by Bouchard in 1866. This phenomenon cannot always be easily induced. In the test for this sign, I would suggest that the subject's arm be in semi-flexion and in pronation, and that the forearm be immobilized.

I shall do no more than mention the analogous trepidation more rarely observed in the fingers and toes.

The several varieties of epileptoid trepidation I have just described are due to excitation of the tendon that is persistent or renewed at short intervals. If, in the examination of a tendon reflex, a single percussion is followed by several successive jerks, one is dealing with a reflex called *polykinetic* (A. Charpentier) which is analogous to spinal epilepsy and has the same meaning when it is well marked.*

In the same order of facts belong the cases in which, under the influence of a displacement of a limb, spontaneous or provoked,

*[The polykinetic reflex of Charpentier was pointed out by the translator in 1903, as the result of studies of dementia paralytica. It was described (Outlines of Psychiatry, p. 83, 1904) as follows: "Exaggeration (pathological) of the knee-jerk is revealed by a clonic movement of the leg when the (patellar) tendon is tapped; the clonic movements of an exaggerated knee-jerk can only be estimated as indicative of exaggeration through experience in the examination of patients; quality and distinctive peculiarities cannot be satisfactorily described. For an experienced observer, it is not difficult to distinguish these clonic movements from the lively or tremulous knee-jerk of normal or hysterical persons." The polykinetic reflex of the patellar tendon is frequent in certain forms of paresis, but in which often neither patella-clonus nor ankle-clonus can be elicited.]

there is set up a reflex trepidation for a shorter or longer period when the limb is left untouched.

Two other phenomena which indicate surreflexivity, especially in the lower extremity, should be mentioned: the sign of Rossolimo and that of Mendel-Bechterew. The sign of Rossolimo is a reflex flexion of the toes provoked by a sudden passive elevation [extension] of them induced when their tips are snapped lightly [upward] by the examiner's finger. The sign of Mendel-Bechterew consists of reflex flexion of the toes induced by percussion of the dorsal surface of the foot. Physiologically such percussion causes extension of the last four toes due to idiomuscular contraction of the small muscles of the foot. We may, with Yoshimura, of Tokio, interpret the inversion of this movement as follows: Exaggeration of bone and tendon reflexes of the lower limb may show in the appearance of a reflex of flexion of the toes; so the effect of this reflex, provoked by percussion of the dorsal surface of the foot, if powerful enough, mask those of the [normal] idiomuscular contraction.

All the clinical manifestations that have just been described permit the affirmation—I again insist—that the tendon reflexes are exaggerated.

The Divers Modes of Surreflexivity.—From the point of view of its distribution, surreflexivity presents itself in divers modes. The two modes most commonly met are (a) unilateral surreflexivity, usually attending an affection of the pyramidal system seated in the cerebral hemisphere of the opposite side, or, more rarely, associated with a spinal lesion on the same side; (b) bilateral surreflexivity of the lower extremities, almost always due to a spinal affection, but which may exceptionally be caused by a bilateral cerebral affection, cortical or subcortical.

There are other rarer types which I shall point out:—

(c) Surreflexivity limited to one lower extremity. This type, sometimes due to a cortical affection, depends much more often upon a lesion of spinal location; and in the last case, in truth, the surreflexivity affects ordinarily the other limb in a certain [lesser] degree. There is a series of transitional cases between this type and bilateral surreflexivity of the lower extremities.

(d) Surreflexivity limited to one of the upper extremities. This type is seen more rarely than the preceding; it is scarcely caused by any other lesions than those seated in the cortex or immediately beneath it; for, except in this region, the fibres of the pyramidal tract are everywhere so close together that a lesion affecting the fibres destined to control the upper extremity, almost inevitably implicates those that control the lower extremity.

(e) Surreflexivity affecting all four extremities. This type may be divided into two subvarieties. In the first, all the tendon and bone reflexes of the upper extremities are exaggerated; this type

is due to a bilateral lesion either of the brain or of the cord above the fourth cervical segment. In the second subvariety the exaggeration of the tendon reflexes of the upper extremities is only partial; the reflex of extension of the forearm, for example, being exaggerated while that of flexion of the forearm, on the contrary, is enfeebled or abolished; here we have to deal surely with a spinal affection. I shall return to this point.

(f) Finally, the surreflexivity may occupy the two lower extremities and one upper extremity. This is a rare type which I merely mention.

In general, exaggeration of the tendon reflexes is established in a progressive manner. It may be transitory, but more frequently it remains, subject sometimes to alternations of diminution and augmentation.

Surreflexivity is usually accompanied by other symptoms: paralysis, contracture, etc., but it may be found as the unique sign of a pathological state. However, this is much rarer than for irreflexivity. For when surreflexivity reaches a degree intense enough, it inevitably causes disturbance of motor functions.

Affections that Cause Surreflexivity.—I shall review the principal affections of the central nervous system in which surreflexivity is one of the usual manifestations, and try to bring out what each of them presents of a particular nature when regarded in its relations to this symptom.

Lesions of the Brain.—Various affections of the brain—hemorrhage, softening, tumor—implicating directly or indirectly the pyramidal tract, provoke disturbances of motility and cause, at one phase of their evolution, surreflexivity.

Let us study first exaggeration of the tendon reflexes in its relations to *organic cerebral hemiplegia*.

Let us consider first the most common variety—common hemiplegia in the adult, caused by a focal destructive lesion and having as a result a secondary degeneration of the pyramidal tract.

In the phase when the degeneration is completed, the tendon reflexes on the paralyzed side are exaggerated. The intensity of the surreflexivity is generally proportioned to that of the paralysis. In organic hemiplegia the surreflexivity is very easy to recognize. The tendon reflexes examined exclusively on the paralyzed side present in themselves, usually, the intrinsic characteristics which constitute the criteria of surreflexivity (clonus, polykinetic reflex, etc.). In addition, without consideration of the preceding characteristics which may be *fruste*, comparison of the paralyzed with the opposite side reveals the surreflexivity. In the majority of cases the difference between the two sides is especially marked in the reflex of flexion of the forearm on the arm. In the lower extremities, the inequality of the "contralateral reflex of the ad-

ductors," described by Pierre Marie, a reflex often wanting normally, is sometimes very striking; percussion of the patellar tendon on the sound side, or, better still, of the internal face of the femoral condyle, causes very marked adduction of the paralyzed thigh, while the same manoeuvre on the affected side causes no reaction on the sound side, or induces adduction of less degree.

We have just seen that hemiplegia in the adult, in the period of completed secondary degeneration, is accompanied by surreflexivity. What is the state of bone and tendon reflexes in the initial phase? Immediately after the stroke the reflexes may show no change; sometimes they are enfeebled or abolished; sometimes, exaggerated. This last condition is not perhaps as rare as it was thought to be formerly. In 10 cases of recent hemiplegia observed by Ganault,* the knee-jerk was normal in 3, weak in 2, exaggerated in 5. Gendron and Miraillé have told of 6 cases of apoplexy, examined a few minutes after the stroke, in which the knee-jerks especially were already exaggerated.

It may be said, approximately, that the surreflexivity is established at the end of the second week following the attack. Once established, the exaggeration of the tendon reflexes, in the form of hemiplegia which we are considering, undergoes no change of importance. It may become less in some degree, but it does not disappear.

Let us now consider an organic hemiplegia due to a cerebral lesion which exerts a disturbing but not a destructive influence on the pyramidal system, and which does not cause a secondary degeneration. Let it be a hemiplegia due to a *hemorrhage into the external capsule*, or to a *meningeal hemorrhage*. The tendon reflexes may, during a longer or shorter period, comport themselves as in the usual form which has just been considered. But, contrary to what takes place in common hemiplegia, the surreflexivity, after having been sometimes very marked, may become less and disappear. Its regression, moreover, coincides with that of the paralysis.

Let us take as another example of hemiplegia without secondary degeneration, a case of intracranial neoplasm which compresses the pyramidal tract without destroying it. The surreflexivity, one of the possible manifestations of this compression, will sometimes undergo regression, as in the case of hemorrhage into the external capsule or of meningeal hemorrhage. The return of the reflexes to the normal state coincides also with the cure of the paralytic symptoms, obtained by medication (specific treatment, if it be a luetic neoplasm) or by surgical intervention (removal of the tumor).

It is to be noted that in hemiplegia by slow compression, contrary to what is seen in other forms of hemiplegia, the surreflex-

*Contribution to the Study of Some Reflexes in Hemiplegia of Organic Cause (Thèse de Paris, 1898).

tivity is never preceded by a phase of sub- or of irreflectivity; it is often insidiously developed, and it may progress during several months before attaining its full development.

The various cases of hemiplegia thus far considered have been marked by the presence of surrefectivity, at least in one of their phases. There is reason to ask whether exaggeration of the tendon reflexes necessarily accompanies a permanent organic hemiplegia. This is the question now to be discussed.

It is necessary, above all, to avoid confusion. Under the title *cerebellar hemiplegia*, unilateral disturbances of motility without accompaniment of surrefectivity have been described. These facts do not enter into the domain of our discussion; these are not cases of hemiplegia, that is, of unilateral paralysis, but motor disturbances of a totally different nature (excess-movements, asynergy, adiadokokinesia).

With this elimination made, we must consider successively hemiplegia without secondary degeneration of the pyramidal tract and hemiplegia with such degeneration.

With regard to the first variety, I can reply in the affirmative to the question asked. I have reported* the case of a patient having an intracranial tumor compressing the psychomotor region without destroying it, in which, in spite of the presence of very manifest motor disturbances (Bravais-Jacksonian epilepsy, marked hemiparesis, slight stiffness) of very long duration, the tendon reflexes underwent no exaggeration. The absence of surrefectivity, coinciding with a hemiparesis manifestly organic and already old, is one of the arguments on which I relied in affirming that in this case one had to do with compression of the Rolandic area without secondary degeneration.

It remains to be seen whether surrefectivity may be wanting in hemiplegia with secondary degeneration. Assuredly this is possible if, with the lesion of the pyramidal tract, there be associated alterations of the tendon reflex arcs (for example, association of tabes and hemiplegia). I shall soon return to this point.

Are other associations capable of producing the same effect? Can lesions of the thalamus or of the striate body, associated with an alteration of the pyramidal tract, cause absence of surrefectivity? What leads to this question—a simple hypothesis—is principally study of infantile hemiplegia, in which absence of surrefectivity is often noted** and in which lesions of the basal ganglia are quite common. But in the actual state of our knowledge, it is impossible to give a definite answer to the question; to clear up this point new anatomo-clinical researches are necessary. It is also to be remarked

*De la paralysie par compression du faisceau pyramidal sans dégénération secondaire (*Revue neurologique*, p. 693, 1906).

**On this subject see: Sur l'absence fréquente de la contracture permanente dans l'hémiplégie infantile, par E. Long (*Revue neurologique*, XIV, p. 9, 1910).

that in observations labeled "infantile hemiplegia," there are cases of hemispasm rather than of hemiplegia properly speaking: the paralytic feature is accessory or wanting, the element 'spasm' is unique or predominant. The absence of surreflexivity is perhaps due to the fact that the basal ganglia may be implicated and the pyramidal tract be intact.

With regard to the facts of hemiplegia with degeneration, uncontestedly pure—absence of all association having been verified anatomically—I do not know a single case, either in the child or in the adult, in which exaggeration of the tendon reflexes was wanting.

Lesions of the Cord.—Surreflexivity in lesions of the cord is an extremely common symptom; a fact readily understood by reason of the important place occupied by the pyramidal tracts in this part of the nervous system.

Here it is perhaps not out of place to call attention to the fact that the relations of surreflexivity to disturbances of voluntary motility are different, depending on whether the pyramidal system is implicated in the cord or in the brain; in cerebral lesions—at least in the adult—when the exaggeration of the reflexes is extreme, there are paralytic symptoms that are quite marked; but this is not true in lesions of the cord, in which very marked surreflexivity may coexist with almost complete conservation of the muscular power.

Let us examine first the pathological type described by Erb under the name of 'spastic spinal paralysis,' and named by Charcot 'spasmodic tabes dorsalis.' In this type, clinically well defined, there exists a contrast noted by the eminent neurologist of Heidelberg, between the notable exaggeration of the tendon reflexes and the relative integrity of muscular power; the surreflexivity develops little by little; it is never preceded by a phase of irreflexivity or even of subreflexivity, and, once developed, it continues indefinitely. Have we here, as Erb thinks, a nosological entity conditioned by a systematized sclerosis of the pyramidal tracts, without focal lesion, or a syndrome, as others maintain? This is a question outside our present purpose.

Whatever the fact may be, various diffuse spinal affections—syphilis, multiple sclerosis, traumatic lesions, syringomyelia—may at some moment of their evolution present a symptomatic picture, if not identical, at least very like that of primary lateral sclerosis (Erb).

However, in looking at these affections from the point of view of the tendon reflexes, which alone interest us here, we may sometimes discover very notable differences. These differences depend either upon the fact that secondary degeneration is wanting and the lesions are capable of repair, or upon the fact that other lesions are associated with those of the pyramidal tracts.

The irreflexivity dependent upon *syphilitic alterations* disappears sometimes after specific treatment.

The surreflexivity of *multiple sclerosis*, like other symptoms of

this disease, is subject to variations. It may recede after having been very marked; sometimes it becomes replaced by subreflectivity or by irreflectivity.

If *syringomyelia* is capable of producing in the lower extremities disturbances identical with those observed in spastic spinal paralysis, among the others, very marked surrelectivity, generally the state of the tendon reflexes in the upper extremities is very different.

I shall return to this point apropos of the relation between surrelectivity and irreflectivity.

It is known that the *paraplegia of Pott's disease*, even after having been total, is sometimes cured. Facts of this kind, from our present point of view, may be divided into two categories. In one class of cases, in spite of the regression of the paralysis, the surrelectivity continues, because there has taken place secondary degeneration of the pyramidal tracts; in the second, the surrelectivity itself disappears, because the pyramidal tracts were simply compressed, not degenerated.

The surrelectivity due to *compression of the cord by a tumor* may also disappear completely after removal of the tumor, as may the other symptoms caused by the affection.

Exaggeration of the tendon reflexes constitutes one of the cardinal signs of *amyotrophic lateral sclerosis*, a disease discovered by my illustrious master, Charcot. It is especially in this affection that examination of the jaw-jerk, often much exaggerated, is of interest. For this, one proceeds as follows: The patient is asked partly to open the mouth without fixing the jaw; then a tongue depressor is applied gently on the lower dental arch, the percussion is practised downward on it. The jaw is depressed by the blow and then raised by the reflex contraction of the masseters.

Contrary to what is seen in the spastic paralysis of Erb, in Charcot's disease the surrelectivity may diminish and give place to subreflectivity when the lesions of the anterior horns have reached a certain intensity. I have even seen one case of amyotrophic lateral sclerosis in which the tendon reflexes of the lower extremities were never exaggerated, and which, even in the initial period, showed itself in enfeeblement of the ankle-jerks.

In the various spinal affections thus far considered and which usually have a slow evolution, the disturbance of the tendon reflexes is almost always shown from the beginning in surrelectivity. This is not the case in a spinal affection of sudden onset. If, for example, a vertebral abscess bursts into the spinal canal, paraplegia with abolition of the tendon reflexes may result, with sometimes subsequent surrelectivity. This is seen generally also in *transverse myelitis*, in which surrelectivity is only a late phenomenon, usually preceded by a phase of subreflectivity or irreflectivity.

(TO BE CONCLUDED.)

MEDICAL AND SURGICAL PROGRESS.

ANTERIOR POLIOMYELITIS.

A REVIEW OF THE RECENT LITERATURE IN REGARD TO THE EPIDEMIOLOGY, ETIOLOGY, MODES OF TRANSMISSION, BACTERIOLOGY AND PATHOLOGY. ITS CLINICAL MANIFESTATIONS AND ITS TREATMENT.

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In attempting any adequate review of the literature of the past few years on this all-important subject, it has seemed wise to subdivide the material into the following subdivisions—namely,

1. Epidemiology.
2. Experimental { Etiology—Modes of Transmission.
Bacteriology and Pathology.
3. Clinical Manifestations.
4. Treatment.

The subject will then be presented in sections in a logical and natural way, and the conclusions arrived at in their proper sequence.

Anterior poliomyelitis, or infantile paralysis, as it is more commonly known, has been endemic in northern Europe for many years, but it is only in the last few years, that is since 1907, that we have had epidemics here in the United States and Canada, due probably to the influx of immigration from Europe, causing epidemics along the Atlantic Coast and especially in Minnesota and the Middle West where many Scandinavian immigrants have gone.

These epidemics have been both large and small in closely and sparsely built communities, and in districts far separated from each other where the means of infection has been sought in vain.

The spread of the disease has been gradual, so that apparently no part of the country is now free from infection.

The date usually assigned for Heine's original description of the disease is that of his celebrated monograph of 1840, the second edition of which in 1860 first introduced the term 'Infantile Spinal Paralysis' (1). He had, however, previously reported the disease to the Society of German Naturalists and Physicians in 1838. Before this, however, Dr. John Badham of Workrop, England, had published four well-authenticated cases of infantile paralysis in children of two years of age which occurred at about the same time and in the same locality. Heine, in his monograph of 1860, had already noted the possibility of the contagious or epidemic character of the disease.

The next to describe the disease were Rilliet and Barthez, French pediatricians, but Charcot's description of 1870 with full autopsy reports is the most important. In the summer of 1887 O. Medin noted the first epidemic of the disease in Stockholm.

Harbitz and Scheel state that in Norway there were 18 cases of infantile paralysis in 1903 with 6 deaths—in 1904 an epidemic of 41 cases and 6 deaths, and a second one of 20 cases and 6 deaths.

In 1905, the disease became more serious and invaded a great many districts. Altogether 719 cases with 111 deaths were reported in 1905, and 334 cases with 34 deaths in 1906, giving a mortality of 13.8 per cent. in two years. The mortality varied according to the frequency of the occurrence of abortive cases.

Early in the summer of 1907 there began an epidemic of poliomyelitis in and about New York City, so that in one hospital there were treated 138 cases (2). The occurrence of the epidemic suggested a mode of infection through the intestinal tract, in that many of the cases were preceded by diarrhea and dysentery. Out of 100 cases, diarrhea and vomiting occurred in 19 per cent., vomiting and constipation in 11 per cent., diarrhea alone in 11 per cent., constipation alone in 11 per cent., and vomiting alone in 11 per cent. In support of the theory of the epidemic nature of the disease, a comparison of 1906 with 1907 showed that in 1906 there were but 36 cases, while for the corresponding time in 1907 there were 387 cases, of which 216 were males and 171 females. In this epidemic there were many cases beyond the infantile period of life.

Starr (3) reports the same epidemic more fully, stating that there were probably over 2,000 cases, extending along Long Island Sound into Connecticut and up the Hudson. The disease began to show itself about May, 1907; the number of cases increased rapidly during June and July and the epidemic reached its height in July and August, and a few were then reported until December, 1907. The mortality was about 6 to 7 per cent. The summer was not an unusually hot one, but the rainfall was about one-half the usual amount. Other infectious diseases were not particularly prevalent.

The onset of the disease was acute, the paralysis developed on the third or fourth day, appearing with considerable suddenness and at its maximum extent from the beginning. Pain was a marked symptom in almost all the cases and was referred to the muscles involved or to the back. The acute onset usually subsided in the course of a week or ten days, and a state of improvement was noticed beginning at the end of the second to the fourth week. In

many cases complete recovery occurred. In these cases the paralysis was never very intense; in others it was merely a sense of fatigue and unwillingness to use the muscles. These were classed as 'abortive' cases. The high mortality of 7 per cent. was unusual, as death is a very rare occurrence in sporadic cases.

Starr states that epidemics of infantile paralysis are more common than has been supposed, and has collected a list of 44 such epidemics, which he presents as follows in order of their occurrence.

Leegaard (4), in Finland, was thought to have been the first to describe an epidemic of poliomyelitis, at least in Europe, his report covering 13 to 18 cases. It was then found that the disease had been clearly described in 1868 by A. C. Bull, a county physician in Norway, under the title of "Meningitis Spinalis Acuta." Bull reported 14 cases and 5 deaths. 12 cases occurred in children between four and ten years of age, one in a girl of fifteen and one in a man of twenty. He also mentioned the so-called abortive cases.

Colmer (5) reports 11 cases in West Feliciana, Louisiana, in the fall of 1841, where all the cases were under two years of age, and where all recovered.

Bergenholtz (6) reported an epidemic of 13 or 18 cases in 1881, in the town of Umea, North Sweden.

Cordier (7) observed 13 cases in June and July, 1885, in the town of Saint Foy, near Lyons, France. Other cases were seen and heard of in the vicinity; four died of respiratory paralysis.

Oxholm (8) reported an epidemic in Mandel, Norway, in July, August and September, 1886, of 9 cases without mortality.

Medin (9) observed an epidemic between May and November, 1887, in Stockholm, of 43 cases, with 3 deaths. Medin was the first to call particular attention to the epidemic occurrences of infantile paralysis at the Tenth International Medical Congress, 1890.

Putnam (10), in the summer of 1893, observed an unusual number of cases in Boston, Mass., where 26 cases were observed in the months of August and September, when the usual number seen was about six to eight.

André (11) saw 4 out of 9 cases observed at Saint Giron, near Toulouse, France, and its two adjacent towns, Cescan and Seix, in July and August, 1893. They all occurred in infants under three, and all recovered.

Caverly (12) reported the first serious epidemic in this country, which occurred in Rutland, Vt., between July and September, 1894. Rutland is in a valley; and it is interesting to note that in a large number of these epidemics the site of the occurrence has been near a stream or in a narrow valley, during a summer, which has been extremely hot and rather dry. This was the case in Rutland. He records 126 cases, with 18 deaths. It was noticed in this epidemic that horses, dogs and chickens were also affected.

Pieraccini (13) noted a small epidemic in Monte Spertoli, near Florence, Italy, a village lying on the side of a mountain, in a high altitude and a dry locality. This epidemic occurred between June 23rd and August 10th, 1895. There were 7 cases, all of which recovered.

Bucelli (14) reported a number of cases in the Ravicca quarter of Genoa, in 1895. He also adds that an epidemic prevailed at the same time in Arenzano, a suburb of Genoa.

Medin (15) observed an epidemic in Stockholm in the summer of

1895. There were 20 cases seen between June and September; all had fever and the majority had the legs affected. This epidemic occurred in the latter part of the summer and early autumn, at a time when infantile diarrhea was quite prevalent in Stockholm.

Altman (16) observed an epidemic of 18 cases at Port Lincoln, South Australia, during the months of March and April, 1896, the hot and dry months in Australia. This appears to have been the first epidemic on record in Australia. Port Lincoln is a small town of not over 1,500 inhabitants. The cases were all over three years of age, and none died.

Pasteur (17) observed at Much Hadham, England, in July, 1896, 7 cases in one family living in the same house, all attacked within ten days. The neighborhood was a healthy one and there were no particular circumstances indicating in any way the cause of the disease. The children ranged from one and a half to eleven years of age. There were no other cases in the neighborhood.

Taylor (18) saw in July and August, 1896, 7 cases at Cherryfield, Maine. This disease appeared to be infectious, as the second patient was a brother of the first, the third, a cousin of the first and second, and the fourth was visiting in the house where the first three patients were affected. There were also 2 cases occurring at the same time in a neighboring town.

Bondurant (19) reports 15 cases occurring in Greene County, Alabama, during the summer of 1896, both whites and negroes being affected. There were no deaths; malaria was present at the time.

Buzzard (20) called attention to an unusual number of cases of infantile paralysis in a small district of London, in September, 1897, and gives details in 11 cases. All were children under five except one boy of fourteen. In two instances the patients were sisters, or a brother and sister. There were no deaths. Several others were heard of, at the time, but not seen.

Taylor (21) saw a rather large number of cases at the Hospital for Ruptured and Crippled, New York, in July, 1897.

Pleuss (22) records 4 cases which had been seen in Kiel, between June and September, 1897. These might be accounted for as sporadic cases.

Newmark (23), of San Francisco, records a small epidemic occurring in the town of Le Grand, Merced County, California, in June, 1898. It is a village of 49 people; none of the patients died. Four children were affected, the first and second being brothers, the third a playmate of the first and second, and the son of the doctor who attended them. They were all boys between eight and ten years of age.

Packard (24) records the fact that during the summer at Royersford, Pa., there were 2 cases developing in the same house, within three days of each other, in a brother and sister. He considers this observation as of importance in supporting the infectious nature of the disease.

Auerbach (25) reports a small epidemic occurring in Frankfort-on-the-Main, between May and December, 1898. There were 9 cases observed and several others heard of. In one case there was a recurrence of the disease in August after the first attack in June. This case is noteworthy for the fact that one attack usually confers immunity.

Zappert (26) reports an epidemic which occurred in Vienna, in 1898. 208 cases were observed and these occurred chiefly in the summer, between June and November. No cases were observed where other children of the same family were attacked.

Wickman (27) observed 54 cases during an extensive epidemic in Stockholm in the summer of 1899; 3 cases died. The majority of the cases occurred in July, August and September, and almost all the patients were under five years of age. In 3 different houses 2 cases of the disease occurred, and in several families 2 or 3 cases were observed among cousins, brothers and sisters. Wickman noticed that the disease was not generally spread throughout the city, but was localized in certain parts, so that the cases tended to be grouped. In one instance there occurred a case in a house from which a family moved; a second case developed in the family which moved into this house soon after it was vacated by the first family. This he considered good evidence as to the infectiousness of the disease.

Leegaard (28) in Bratsberg, Norway, observed 54 cases between April and November, 1899. All ages were affected, but the majority were children under eleven; 2 cases died.

Chapin (29) gives the details of 7 cases seen by him during an epidemic in Poughkeepsie, N. Y., in July and August, 1899; 30 or 40 cases were seen by physicians during that summer. The majority of the cases made a complete recovery, a fact which has been noticed in a number of epidemics, and has a distinct bearing on the prognosis.

McKenzie (30) describes 17 cases occurring in Washington and Amenia during the summer and autumn of 1899. These are small towns near Poughkeepsie, N. Y., and the epidemic coincided with the one described by Chapin. Three of the 17 cases died within four days of the onset.

Painter (31) saw 52 cases between June and September, 1900, in Gloucester, Mass.; 38 of these were under his care. They were in children between thirteen months and ten years of age; there were no deaths. In some instances two members of the same family were affected.

Woods (32) reported an epidemic of 55 cases in San Francisco, in March and June, 1901. The weather was damp and cool. Most of the cases occurred in infants. There were no deaths.

Wickman (33) observed 20 cases in Gotteborg, Sweden, between July and November, 1903; three were sisters; one case died.

Lorenzelli (34) reported 26 cases in Parma, Italy, between March and September, 1903. The majority of cases were under five.

Blackhall (35) reported 6 cases in Queanbergan, New South Wales, during an extensive epidemic in December, 1903, and January and February, 1904, which is the hot season in Australia. Two cases were sisters, two were cousins; none of the cases was fatal.

Litchfield observed 25 cases at Sydney. The summer was more wet and cool than usual. During the summer there was an extensive epidemic of gastro-intestinal influenza. There were no deaths.

Wade observed 34 cases at Stanmore, near Sydney, all cases being under seven years of age. All cases had a febrile onset with vomiting, diarrhea and severe sweating; there were no deaths. Some permanent paralysis was left in the majority of cases. In several

instances two or three members of the same family were affected. Some would have a permanent paralysis, while others in the same family would suffer from malaise and general weakness, but make a full recovery. This was the second Australian epidemic.

Ham (36) reports an epidemic in Brisbane, Queensland, from October to December, 1904. 108 cases were reported with almost all patients being under the age of ten; 4 cases died. This was the third Australian epidemic.

Nannestad (37) observed 41 cases in Hvalen, Norway, between June and October, 1904. Most of the cases occurred in infants. No case died.

Platon (38) observed in the same year in another part of Norway, a small epidemic at Aafjorden, in August. There were 20 cases and 6 deaths.

Giersvold (39), in Norway, reported the most extensive epidemic hitherto reported, which occurred in Norway and Sweden, in the summer of 1905. He observed 437 cases in the neighborhood of Trondhjem, between April and October. There were 67 deaths. It was apparently possible in this epidemic to trace the extent of the disease by contact from one village to another, and from house to house. There was a difference of opinion among the physicians as to the contagiousness of the disease, and some laid it to the condition of the water supply, and pointed out that the disease was more prevalent in damp places surrounded by swamps.

Wickman (40) described in detail 1,031 cases occurring between May and October, 1905, in the southern part of Sweden. These cases were distributed through a large number of villages adjacent to each other, and Wickman believes that his careful investigation proves the contagious character of the infection. Many cases occurred in the same house, and in many instances two or more members of the same family were affected. In one town 16 or 18 cases originated from a single school-house. In the majority of cases contact between cases could be traced. New tenants of houses vacated by patients suffering from the disease were affected also. Wickman investigated the epidemic with great care, especially the question of contagion and mode of extension, and from his evidence it is hard to escape the conclusion that the disease is actually contagious, and that like scarlet fever it can be carried through the medium of a third person. Dogs and other animals were likewise affected in this epidemic.

Wickman (41) saw a smaller epidemic in Sweden in 1906, reporting 50 cases.

Lundgren (42) noted an epidemic at Vardo, Norway, in the summer of 1905. He records 403 cases, occurring chiefly in children between six and fifteen years of age. The disease was apparently contagious, as many cases were traced where the contagion seemed evident. Ten per cent. of the cases died—a very high mortality. Permanent paralysis of some type was left in 25 per cent. of the cases.

Terriberry (43) reported an epidemic of 50 cases which occurred at Ridgway, Pa., in the summer of 1907. The geographical conditions of this epidemic were of interest. Ridgway is situated in a valley in the Allegheny Mountains, about 16 miles in length. The first case appeared at Elk Creek, where 12 cases were seen. Two weeks later cases appeared at Ridgway, nine miles below Elk Creek,

and in that town 30 cases eventually appeared. One week after the cases appeared in Ridgway, cases developed in Scotland Mills, 9 miles below Ridgway, and there 8 cases developed. It was evident that the infection extended down the valley in a definite direction, and that the incubation was from one to two weeks. 4 cases out of the 50 died. They were all children, and in every instance two or three cases appeared in the same family.

Griffin (44) reports 20 cases occurring in Oceana County, Mich., in the summer of 1907, chiefly in infants. In proportion to the population, there were ten times as many cases in Oceana County as in the New York epidemic.

Free (45) reported an epidemic which occurred at Dubois, Pa., in the summer of 1907. Over 100 cases were observed in the Allegheny Mountains about Dubois. There were only a few deaths. Pigs and chickens were also affected.

Ordinarily the mortality of poliomyelitis in sporadic cases is very low, but in epidemics it varies from 6 to 10 per cent. Fatal cases occur between the fourth and tenth days, the paralysis extending to the respiratory muscles. It was also demonstrated that about 25 per cent. of the cases made a complete recovery, whereas this is not true in sporadic cases.

Hamilton (46) reported three epidemics of poliomyelitis, all more or less extensive, occurring in Minnesota, in 1908. At Hibbing 16 cases were reported; at Northfield, 30 cases, and at Barnum and Moore Lake, 45 cases. There were also numerous isolated cases throughout the state. All epidemics came in the autumn and disappeared after the onset of cold weather. 13 deaths were reported, out of 150 cases. There was no evidence found that the disease was infectious or contagious. It was also reported that an identical disease occurred among colts and young horses at the same time.

Collins and Romeiser (47) reported the New York epidemic of 1907, which began in July and ended in October, there being as many as 1,200 to 1,500 cases. In this epidemic 1 case in 10 or 11 made a good recovery, and about 1 in 20 recovered absolutely. In an analysis of 500 cases, there were 202 males and 114 females affected. The dangerous age was between one and three.

Lovett (48) in the report of the Massachusetts State Board of Health on Infantile Paralysis for 1909, speaks of the various epidemics, especially one of 140 cases in Cuba, in 1909, and states that this was the first epidemic reported from the tropics. Apparently the disease did not exist in Cuba before 1907. It seemed possible that the disease was imported to Havana from New York. He states that in the five years previous to 1909, about 8,054 cases occurred, of which the United States contributed 5,514, the bulk of these being in the northern states. He states that in 1909, Massachusetts suffered as much from the disease as any country in Europe. As many cases were reported in Massachusetts as in the two other most severely affected states in the Union—Nebraska and Minnesota taken together. It occurred generally in river valleys, and a case rarely occurred in a town without one or more cases in contiguous towns. It was relatively more prevalent in small towns than in the larger towns and cities. The total number reported was 923. There was no deficiency in the rainfall, nor was there any connection between the incidence of the disease and the high temperature. There was found to be no corresponding infection of domestic animals

as reported in some other epidemics. No child, of 150 cases carefully investigated, living on breast milk alone, was affected. 363 males and 263 females were affected, with the period of greatest infection seen between the ages of two and three years. 7 per cent. of the cases occurred in the first year of life and 71 per cent. occurred in the first five years, and 87 per cent. of the cases in the first ten years of life.

Krause (49) reported the epidemic which occurred in Westphalia, in 1909. The entire number of deaths among 436 cases of the Province Arnsberg numbered 66, the youngest child attacked was four and a half weeks and the oldest fifteen years. Most cases occurred in the second year of life. Girls were affected more often than boys. In over 90 per cent. of the cases symptoms referable to the stomach and intestines were noted at the beginning of the disease, and in two-thirds of the cases the children were attacked with severe diarrhea, rarely with vomiting, while in one-third constipation was present. In many cases other members of the family had diarrhea. The paralysis affected the limbs in the following order: one leg or single group of muscles; one arm; both legs; one-half of face; both legs and one arm; and lastly, paralysis of the bladder, which occurred only with coincident paralysis of both legs. In the fatal cases, respiratory paralysis seemed to occur regularly. Krause distinctly advocates the infectious character of infantile paralysis. The occurrence of groups of cases was plainly established. A remarkable mortality among chickens coincident with the disease was established.

Shidler (50) reports a number of cases occurring in the epidemic in Nebraska, in 1909. He shows by some striking facts how apparently the disease spread by infection, from town to town, and from family to family. He analyses 60 cases carefully. The evidence on the infectious nature of the disease is most striking. He showed how a young man working on a threshing crew with seven other men contracted the disease. These men all drank out of the same jug, worked together, ate together, and all developed the disease. The disease spread from Benedict to Marquette and elsewhere in the following manner. A child came into Benedict from near Polk, Nebraska, and was taken ill; it returned to the country, where the disease was diagnosed as epidemic poliomyelitis. The twelve-year-old daughter of the family next had the disease. Several weeks later the son-in-law of the parents of the affected children came from Marquette, Nebraska, with his infant son and visited over night. In five days the infant came down with the disease, this being the first case in Marquette. A child of another family came in from the country to the house of the above-mentioned family in Benedict about a month later, not having been allowed by its parents to see any other child all summer. She stayed one night in this house, returned home in the morning. In five days she became ill, and after three days developed paralysis of both legs. Other striking instances of apparent contagion are given.

McClanahan (51) reports more fully the Nebraska epidemic of the summer of 1909. There were slightly over 1,000 cases, with about 137 deaths. The first case was reported in March, and only 20 cases after November. Four-fifths of the cases occurred during July and August. These months were unusually warm and dry. 55 per cent. of all cases occurred in Polk and York Counties, with a

total population of 31,000 people. It was a disease of the rural districts. A Fourth-of-July celebration was held in Stromsberg, Polk County, and within two weeks after that the disease spread like a wave over the adjoining country. Quarantine was established with excellent results. The fatal cases were nearly all of the bulbar type of paralysis. Constipation was the rule; diarrhea, the rare exception; vomiting was rare. The disease seemed to have an inhibitory effect on the intestines. The extreme age limits were four months and sixty-seven years. The oldest fatal case was thirty-seven.

Jacelyn Manning (52) reports an epidemic of 352 cases which started in 1908 in Eau Claire County; 167 of the total cases occurred in that county. She gives a mortality of 15.3 per cent. She noted a rash in every case she saw in the febrile stage. 25 cases became ill during the time of, or immediately following, cases in the same house. The maximum number of cases occurred in August and September, at a time when the rivers were lower than they had been for years.

Lovett (53) in a second paper reports the results of the Massachusetts State investigation for 1908. 136 cases were reported in 1908, as against 234 in 1907. Localities severely affected in 1907 were comparatively immune in 1908. Most of the cases occurred in the months from July to November. The majority of the cases occurred in children between the ages of one and two years.

Emerson (54) states that nearly one-half of all cases reported in Massachusetts in 1909 occurred in the western half of the state, in adjacent river valleys. The disease is an infectious one. At the most it is mildly contagious. The marked digestive disturbances suggest the stomach as a portal of entry.

Kramer (55) reviews recent epidemics and states that the mortality is higher than had been supposed and also the number of cases of complete recovery. In the Breslau clinic 196 cases were seen ranging from infancy to thirty years. The summer months showed the largest number of cases.

Koplik (56) reports the New York City and State epidemic of 1909; there were about 1,200 cases. There seemed to be no etiological factors in weather, water or milk supplies, city cleanliness or localization of cases. He speaks of the atypical character of many of the cases and divides them into three groups—namely, cerebral, neuritic and classical—the latter being the usual common type. Intestinal disturbances were present in the great majority of the cases. He concluded that we were dealing with an infection that may attack the white matter and axis cylinders as well as the gray matter of the cerebrum, medulla and cord, and may produce typical acute infectious neuritis as well as anterior poliomyelitis.

Kerr (57) reports 53 cases he observed—a part of the New York epidemic of 1909. Fever, diarrhea, and vomiting were the prominent symptoms at onset.

Wollenweber (58) reports 31 cases personally observed in Dortmund, in 1909. His views corroborate those of Krause in that it was an infectious disease with diarrhea, apparently contagious, with an incubation period of from two to fourteen days.

Langermann (59) reports 4 sporadic cases in the village of Garbenteich from September to November, 1909. It became epidemic by transportation from Marburg, where it existed in epidemic form. 8 cases were observed; 2 of them abortive and 3 fatal.

Reckzeh (60) states that so far in 1909, 500 cases have occurred in the district of Amsberg. The mortality in Bochum was 18.2 per cent. There were no essential differences in this epidemic from the others reported.

Treves (61) reports an epidemic of 8 cases in Upminster, England, a town of 1,700 people. There had been no isolated cases in the town for several years. The weather was hot and dry but not excessively so. The legs were usually affected.

Eichelberg (62) reports 31 cases observed in an epidemic in Hanover, in October and November, 1909—one branch of the first great German epidemic. The onset in 16 cases was with intestinal symptoms, and in 14 they were referred to the air-passages. Paralysis was very severe at first. There were 7 deaths, all from respiratory paralysis. The ages of the cases varied from six months to eight years, 16 occurring in the second year. There was usually no evidence of connection between the cases.

Peiper (63) reports the cases occurring in Vorpommern, in 1909. There were 51 cases recognized and the epidemic extended from July 15th, 1909, through the autumn, especially in October, when 31 cases occurred.

Netter (65) reports the epidemic of 1909 in Paris and concludes that the disease is contagious and that the cases should be isolated as other contagious diseases.

There is a very interesting document (66) published by the state of Washington and detailing the cases which occurred in that state in 1910. The plan of report was copied from that used by the Massachusetts State Board of Health. There is an interesting preliminary historical study. There were 397 cases reported. Their investigations showed that there was practically an even distribution of cases between the larger cities and the smaller cities and the rural districts. The incidence of the disease was greatest between the ages of two and three years. The mortality of the reported and investigated cases—namely, 331 cases, was 8.4 per cent. Fever and constipation were the usual early symptoms, also pain, tenderness and vomiting were reported, with about equal frequency. 18 cases had retention of urine, which condition had also occurred in other epidemics. There was no coincident paralysis among the domestic animals. There were many striking instances of possible contagiousness reported. There seemed to be 23 cases of apparent transmission from person to person, by direct or indirect contact. The seasonal prevalence showed that the majority of the cases occurred in the summer months, as was true of all other reported epidemics.

In the Massachusetts State Board of Health Report (67) for 1910, Lovett and Sheppard report the occurrence of the disease for 1910 in Massachusetts. They state that the disease was nearly as prevalent in 1910 as in the previous year, and affected 153 cities and towns instead of 136 as in 1909. A large epidemic centre existed at Springfield with 148 cases in the city and a large number in the surrounding towns. Another centre existed in Fall River, with 89 cases in the city and others in neighboring towns. The disease occurred in all classes of the community, and it existed under all conditions of sewage disposal and with all kinds of water supply. They state that their researches in the last two years failed to show an excessive amount of dust in the affected locali-

ties. 42 cases out of 200 giving histories of contagion from others, they believe to be of importance. They stated that no definite information as to any one factor was to be found in the antecedents of the attack, since bathing, falls, exposure to heat, overexertion, etc. are common occurrences in children of the affected ages in the summer season. The distribution of the paralysis was made by a skilled investigator to note that under those conditions the comparatively frequent involvement of the back, abdomen, neck and face, a matter often overlooked. The percentage of total recoveries from the paralysis within a period of six months and less after the attack was 13.5 per cent. in 200 cases, as against 16.7 per cent. in a similar class of cases in 1909.

Collins (68) makes a plea in this article for the necessity of establishing quarantine in this disease which is now generally considered contagious. He also reports several epidemics, about 20, which have occurred since 1907.

O'Reilly (69) states that there were 309 cases of infantile paralysis in the state of Missouri in 1910, and that there were 326 cases in the five years preceding January 1st, 1910. These cases were scattered throughout the state, the greatest number occurring, however, through the northwestern and western parts. A rather extensive epidemic of infantile paralysis prevailed throughout this section of Missouri, apparently bearing relation to the epidemics occurring in Iowa, Nebraska and Kansas at the same time. From 1905 through 1910, 81 deaths resulted from infantile paralysis in Missouri, and of this number 33 occurred in 1910. Of these 12 were in Kansas City and 6 in St. Louis. One physician reported that a number of chickens suffered from paralysis shortly after one of the children of the family had been attacked by poliomyelitis, and another reported a similar condition as having occurred among the sheep. The disease was epidemic only in Kansas City. In St. Louis it was sporadic. The author also speaks of the 604 cases occurring in Iowa up to January 1st, 1911, the epidemic of 1909 in Nebraska (64), the 189 cases in Kansas in 1910, and the 5 cases in Oklahoma up to September 1st, 1910, and 15 cases reported in Illinois. All these states are contiguous to Missouri.

Gundrum (70) states that poliomyelitis has existed in California for a good many years, appearing sporadically and in occasional epidemics. The first case which he was able to get accurate information about occurred in Eureka, Humboldt County, in 1875. The case was a typical one and was followed by paralysis of the legs. Another child was said to have had the same disease at about the same time. He could find the reports of no other cases between 1875 and 1896. In 1897 Sherman (71) reported 8 cases which occurred in the state in the summer of 1896; 7 of these were in San Francisco and one in Napa. Newmark (72) reported 4 cases which occurred in Merced County in the summer of 1898. Woods (73) described an epidemic of "about 50 cases," which occurred in and about San Francisco in 1901, with a recurrence of several cases in 1902. The most extensive epidemic the state had had occurred in the summer of 1910, which was reported to the state authorities by Fleischner (74). The epidemic did not differ in its clinical aspects from other epidemics. 125 cases were collected—120 in 1910 and 5 before October, 1911. 75 per cent. occurred from May to September, 1910. The number of males attacked was

double the number of females. 73 per cent. of the cases were under three years of age. In 88 per cent. the onset was sudden and in 12 per cent. was slow. 67 per cent. showed the classical type, about 25 per cent. showed the meningitic type with retraction of the head, and the others were not classified, on account of imperfection in the reports. Of the paralyses, 23 per cent. occurred in the upper, 73 per cent. in the lower extremities, the remaining 4 per cent. being cases in which the trunk and respiratory muscles were involved, causing death. There were 7 deaths giving a mortality of 7 per cent. 82 per cent. of the cases began with fever; 54 per cent. with gastro-intestinal disturbances. In regard to the contagion, the author was able to find a history of exposure in 11 cases only, or 9 per cent. He states that there were no secondary cases in adults, and but 5 demonstrable secondary cases in children. The disease appeared at widely separated points at about the same time, without any definite geographical order. It was of interest to note that in the cold weather the disease invaded the southern part of the state, which had been previously exempt from infection. All the towns but one were on railroad lines.

Bruno (76) relates that recently two young children developed infantile paralysis on a poultry farm near Heidelberg, following the receipt of a consignment of ducks from a distance. One duck was found dead on the seventh day after arrival. Seven days later another duck seemed to be paralyzed, and it was killed and eaten. Three weeks after the arrival of the ducks two others developed the same symptoms of paralysis and a week later a third, but all recovered. None of the forty-seven geese and chickens showed any signs of the disease. The two children developed symptoms on the thirty-ninth day after the arrival of the ducks. The entire family complained of feeling ill for several days with fever and gastro-intestinal disturbances. Bruno also reports a recent case of a child with epidemic infantile paralysis on a farm where a cow had just died with symptoms indicating paralysis, and a paralyzed hen was found a little later. On another farm a goat died with symptoms of paralysis, and ten days later an isolated case of infantile paralysis developed in the farmer's family. He states that at present Heidelberg seems to be the centre of a widespread epidemic of infantile paralysis, although the cases are not very numerous.

Roth (77) reports an epidemic of 6 cases which involved five small villages, separated from one another by not less than two and a half miles. The individuals involved were never in direct communication with one another, nor was there any traceable evidence of the intervention of any possible carrier. They all occurred within a little more than a month in the summer. The one common feature among several cases lay in environment, all cases residing in the immediate vicinity of barns or stables where the fly '*Stomoxys Calcitrans*' was very abundant. Roth believes that in view of the findings of Rosenau which have been confirmed by Anderson and Frost, this insect was the means of the spread of the disease. Jubb, quoted by Roth, reported an epidemic of 8 cases in an urban locality where there had been no previous cases. Jubb, believes the first case originated from a donkey, which was brought from another region. It seemed possible to trace all the succeeding cases to direct or indirect contact with the first patient, or with subse-

quent cases. It is interesting to note, however, that after the first case appeared there was an interval of a year before the other patient became infected. This condition, it was believed, was due to the fact that the brother of the first patient harbored the virus and became a carrier, not being affected by the disease himself.

The Ohio State Board of Health (78) in its January, 1914, Bulletin has the first installment of a rather extensive review of poliomyelitis including a study of the disease as it has occurred in Ohio, also a study of the habits and anatomy of the stable fly, and also reports a number of transmission experiments by means of the stable fly on monkeys. They report a number of sporadic cases in Ohio in 1910, which cases later led to an epidemic. The disease was made a reportable one in Ohio in 1910. It became epidemic in 1911. 76 deaths occurred in Ohio in 1910 from poliomyelitis. In 1911, 142 deaths occurred from this disease. In 1911, Cleveland and Cincinnati, the two largest cities of the state, experienced epidemics of poliomyelitis. The epidemic in Cincinnati was preceded by an epidemic in Covington, Ky. There were 103 cases with 41 deaths, the greatest number of cases occurring in October and November. 90 per cent. to 95 per cent. of the cases were under six years of age, with a large majority between one and two years of age. In Cleveland 55 cases were reported in 1911, the first appearing on January 4th. There were 15 deaths. The disease remained sporadic until September 19th when 5 cases developed, and after that it assumed epidemic proportions.

In 1912, the disease began to appear in January, prevailed in sporadic form until June, when an increase in number took place. 354 cases were reported. Cases were reported from 54 of the 88 counties of Ohio. A tabulation of the cases by seasonal occurrence shows that the largest number of cases occurred during the months of June, July, August, September and October. More cases were reported from cities than from rural districts. There seemed to be no relation to the incidence of the disease and the dust, sanitary arrangements, previous health, trauma, etc. The greater number of cases occurred among the so-called middle class of people. There was no coincident paralysis among domestic animals. There seemed to have been a possibility of spread by contagion and by contact, in about 18 cases. No single school was found to be a focus of infection.

House (80) saw 31 cases in the winter of 1909-1910, which all came from Portland, Oregon, along the lines of railroad and along the Columbia River. There seemed to be no definite foci, and no definite method of spread, except as above stated, of all cases appearing along the lines of travel. All cases were in children under seven years of age.

Poliomyelitis prevailed in epidemic form in Kansas (81) during the summer of 1909. The disease had appeared before in sporadic form in the state, but this was the first epidemic, there being somewhat over 100 cases. The first cases were reported in the latter part of July, and the height of the epidemic was reached in August and September, with a few cases as late as the last of November. The season was unusually hot and dry, particularly in the two counties where the largest number of cases occurred. With the appearance of cold, wet weather the disease ceased. In only nine families in the Kansas epidemic was there more than one case

in a family, although every family but eight had more than one child in the family, out of fifty-eight families whose histories were noted in regard to this point. In 61 case reports there were 18 deaths, giving a mortality rate of 29.5 per cent., which is very high. No abortive cases were reported, although they probably existed and were not recognized. The paralysis attacked both legs, or both arms and legs, with greater frequency than other parts, and usually made its appearance on the second or third day. There were no other points of interest noted which would enable one to draw any definite conclusions as to the method of infection. The majority of the cases were between one and three years, the oldest being forty-three years, and the youngest six months. No method of contagion could be found, and the author does not consider the disease contagious. The mortality was 11.7 per cent. One-third of the cases had one extremity affected—facial paralysis in one case, and 10 cases were reported as relatively recovered.

Lovett (83) reports the prevalence of the disease in the United States and Canada in 1910. He reports a total of about 8,700 cases, not counting Canada or such dependencies as Hawaii, and making no account of states reporting 'a few,' etc. In 1910 the disease was reportable by law in twenty-three states. In Canada the disease appeared most extensively in the Province of Ontario, with 179 cases, with 75 in British Columbia and 11 in Alberta. New Brunswick reported a few cases, but no deaths, and there were cases in Quebec and Nova Scotia with 1 in New Foundland. There was 1 case of a white laborer in the Canal Zone and an epidemic of 33 cases in Hawaii. In April, 1911, an epidemic of 20 or more cases appeared in Louisiana. He states that investigations of epidemics will show that the disease will be found in scattered foci, with cases radiating from the foci. It will reach its height in the late summer; it will follow lines of travel; it will affect children in the first dentition period; and the mortality rate will be from 3 to 15 per cent.

Ferreira (84) states that poliomyelitis made its appearance in Brazil towards the close of 1909. 13 cases in infants were observed during the summer at Sao Paulo and a number in Rio de Janeiro.

Dixon and Karsner (85) state that in 1907 some 200 cases developed in the northwestern part of Pennsylvania. As usual the height of this epidemic was reached by the latter part of September and was stamped out by the latter part of November. A small outbreak of the disease appeared in July and August, 1908. Sporadic cases only occurred in 1909. During the summer of 1910 an epidemic of considerable proportions developed in widely separated sections of the state, reaching a total of 1,076 cases before the winter months. An intensive study of 773 cases showed that 59 gave a distinct history of exposure to previous cases. 437 were males and 336 were females. But 3 cases occurred among colored people. In 44 instances secondary cases developed in the household. 142 cases (18.4 per cent.) recovered without paralysis, and 294 (71.6 per cent.) recovered with considerable residual paralysis. Their figures show that the danger of transmission to another member of the same household is not great. In 289 instances children slept in the same bedroom and only 24 contracted the disease. In 9 instances the disease developed in children after having visited communities where the disease was known to be prevalent.

The number of cases (86) of infantile paralysis was not nearly as large in 1911 as in 1910, yet the disease was widely distributed throughout the United States. The number reported in 1910 was 5,861 with 950 deaths, and in 1911, 1931 cases with 440 deaths, according to the Public Health Reports. The report compiled by the Bureau of the Census from the registration area shows the number of deaths for 1910 as 1,459. The data, however, are incomplete, and therefore the number of cases was undoubtedly larger than these figures indicate. These figures bear out our previous knowledge that the disease has alternate active and more or less quiescent periods owing to lack of susceptible individuals or to attenuation of the infection.

Brues and Sheppard (87) investigated the possible etiological relations of biting insects to the spread of infantile paralysis during August, September and October of 1911 in certain Massachusetts cities and towns, to see what evidence could be adduced to support the theory of infection from insects. They conclude that many facts connected with the distribution of cases and the spread of epidemics of this disease together with the histories of insect bites suggest at least that the disease may be insect-borne. They state that the common stable fly may be responsible to a certain extent for the spread of the disease. They also suggest that if the disease should prove to be common to any species of domestic animals, as is now strongly suspected, a secondary connection of ticks in spreading the disease among such animals seems probable.

Langer (139) reports a study of poliomyelitis in the schools of Steiennark. He believes that schools are a source of infection, and that all possible measures should be taken to prevent the spread of the disease in this manner. He gives detailed reports from 21 schools. He states that he had 60 cases during the school year and 37 during vacation. Where there were several cases in different classes in the same school, twelve times there were 2 cases in the same class, twice there were 3 cases and once 5 cases. In 6 schools the patients were seat mates, and in 10 classes only children of the same sex were affected. In the majority of cases it was found that the children went to and from school together and were closely associated otherwise. At the time of the school epidemics there were also cases among outside children in the neighborhood of the school.

Flexner, Clark and Amoss (142) state that we do not possess a generally acceptable theory to account for the epidemic waves of disease. What is required is an adequate explanation of the initial rise, persistence, and the final fall of the wave as represented by the varying number of the affected. They state that the subject has not been rendered essentially more comprehensible by the discovery of the healthy and chronic carriers of infectious micro-organisms, or by the more ready detection of so-called abortive cases of infection. Indeed, these discoveries only add to the perplexity since they prove that potentially infective micro-organisms capable of starting epidemics are more frequently present in our surroundings than has hitherto been supposed. They state that a factor which has not up to the present been sufficiently considered is that of variations among the micro-organisms themselves that may be directly responsible for the production of epidemics. That micro-organisms along with all living things tend to vary in their biological properties has long been known, but it is only recently

that these variations have been recognized as constituting mutations. Not a few pathogenic bacteria may be changed profoundly in virulence by animal passages. Most often with the effect of intensification, but not infrequently with the contrary effect, the modifications in virulence appear at all times quickly, or even suddenly, and at another time develop gradually. There is no doubt that under many natural conditions the passage of infectious micro-organisms rapidly from animal to animal, or person to person, leads to great enhancement of virulence. There exists experimental foundation for the belief that during the rise, the microbic causes are more virulent than during the fall of epidemics. At the onset, the virus of human poliomyelitis possesses relatively weak pathogenic action for monkeys. By means of a few passages the infective power rises and soon a maximum is reached which endures several years. Ultimately, the infective power falls off and soon becomes greatly diminished, so that finally the power is no greater than at the onset. There exists another fact inherent in all epidemics—namely, the varying number of susceptible persons who fall victims to the prevailing disease. In the light of this presentation, the part played by sporadic and abortive cases becomes more comprehensible. Such infected persons or animals may be considered as carrying specific micro-organisms lacking high virulence for their respective kind. We then can begin to see how the conversion, through favoring causes, of the micro-organisms often into others of high virulence, may be the signal for the appearance of epidemics, arising almost simultaneously in separated and even remote places, when the conditions are similar; just as, on the other hand, the immediate transportation of already elevated micro-organisms, from a place in which an epidemic is already prevailing to new places, may start a similar severe outbreak there. They state that a strain of poliomyelitis virus was propagated in monkeys for four years, during which time it displayed three distinct phases of virulence. The several phases covered different periods of time. At the outset the virulence was low, but by animal passages it quickly rose to a maximum, which was maintained for about three years, when, without known changes in the external conditions, a diminution set in, and increased until at the expiration of a few months the degree of virulence about equalled that present at the beginning of the passages in the monkeys. The cycle of changes in virulence is correlated with the wave-like fluctuation in epidemics of disease which also consist of a rise, temporary maximum, and fall in the number of cases prevailing.

Lust and Rosenberg (88) report 71 cases occurring between March and December, 1913, in Heidelberg. This is the first time this disease has been epidemic in this region; only 4 of the patients were over four years of age. The cases were scattered over a wide region, 32 coming from different places where only one case had been observed, 9 where there had been 2 cases, one place with 4 cases, and one with 3. There was found on investigation to have been some co-existing and preceding paralysis current among the hens, squirrels and two hares.

Pierson (89) reports an epidemic of poliomyelitis which occurred in the summer of 1913 among the Indians in Central Alaska, on the Yukon River. There were four deaths, and residual paralysis in 5 cases. In all there were 30 cases. The epidemic among the human

subjects was preceded by an epidemic of 'distemper' among the dogs. The symptoms manifested by the dogs were the same as those shown by the human subjects. One woman had visited the camp where the dogs were sick, and shortly after her return she was attacked by poliomyelitis and died. He states that in this epidemic there was every opportunity for the germs to be carried by direct contact, on account of the close association of the Indians and dogs. There was ample chance also for the infection to be carried by flies. The disease has been much more prevalent where flies were more abundant. All cases were contracted at or near the fish camp where there were many flies. Other Indians who did not live near the fish camp did not have the disease. A great many dogs owned by white persons had distemper, but none of the white persons had the disease because they kept the dogs chained away from the dwellings and had few flies about, and had their houses screened. There was no study of the virus in these cases, nor any experimental transmission researches. Many of the persons infected were infected with vermin, and the disease may have been carried by them.

This concludes the study of the epidemiology. It will be noted that the disease occurs in epidemics, is probably contagious, is controlled by quarantine, and can be carried probably by a third person, as noted in the Nebraska report of Shidler. The classical type is the predominant one, but meningeal and abortive cases are common. In epidemics there is a relatively high mortality, from 7 to 20 per cent., due to respiratory involvement. The onset is sudden, generally associated with fever, and gastro-intestinal disturbance and generally constipation. When the legs are affected there may be retention of urine. About 25 per cent. of the cases make complete recovery, but no one can tell which case is the one which is going to make such a recovery. Such recovery usually occurs rapidly, that is in the course of the first six or eight weeks. The disease is one largely of the summer months, and attacks usually children between two and three years of age, although adults and elderly persons may become affected.

SALVARSAN AND THE EYE.

A REVIEW OF RECENT LITERATURE.

By JOHN GREEN, JR., M. D., of the Editorial Staff.

1. Blanco: Salvarsan in Ophthalmology. (*British Med. Journ.*, October 28th, 1911.)
2. Browning: On Salvarsan in Diseases of the Eye. (*Ophthalmoscope*, Vol. X, p. 629.)
3. De Lapersonne and Levi: Salvarsan and Diseases of the Eye. (*Archiv. d'Ophthalm.*, January, 1911.)
4. Dolganoff: The Action of Salvarsan in Eye Diseases. (*Amer. Journ. Ophthalm.*, December, 1911.)
5. Ehrlich: New Antisymphilitic Remedy. (*Amer. Journ. Ophthalm.*, Vol. XXVII, p. 225.)
6. Gebb: Is There a Toxic Action of Salvarsan on the Papillomacular Bundle? (*Med. Klinik*, Vol. VIII, p. 1433.)
7. Igersheimer: The Action of Salvarsan Upon the Eye. (*Berichte der Ophthalm. Gesellsch.*, Heidelberg, 1911.)
8. Morax and Fourrière: Reduction of Tension Following Salvarsan. (*Rec. d'Ophthalm.*, July, 1911.)
9. Reese: The Eye and Salvarsan. (*New York State Journ. of Med.*, July, 1912.)
10. Stuelp: Salvarsan in Ophthalmology. (*Wochenschr. fuer Ther. und Hyg. des Auges*, September 18th, 1910 and February 23rd, 1911.)

This abstract aims to summarize recent ophthalmological opinion concerning the efficacy of salvarsan in syphilitic and nonsyphilitic ocular diseases and to indicate what ocular conditions contraindicate the exhibition of the drug in the presence of syphilitic lesions elsewhere in the body. It supplements abstracts on the same subject which appeared in the JOURNAL, October, 1911 and August, 1912.

In the few reported cases of syphilitic disease of the eyelids, both primary lesions and the later specific tarsitis, salvarsan has acted effectively and promptly; the chronic inflammatory thickening of the lid so characteristic of the latter affection has quickly subsided. Chancre of the conjunctiva has also healed readily, following the administration of the drug.

The earlier reports were generally favorable as to the effect of salvarsan in many specific ocular diseases. However, amidst the chorus of approval, there was one discordant note: the drug seemed to have little or no effect on interstitial keratitis due to inherited syphilis. The opinion was expressed that this failure was due to the fact that the cornea, being an avascular structure, the drug reached the tissue in a too attenuated form. It was not until salvarsan and neo-salvarsan began to be administered in repeated

doses and mercury freely exhibited in interval, that favorable results were reported. But even to-day there are many ophthalmologists who pin their faith to the older treatment, believing that, after all, salvarsan does little more than lessen photophobia and ciliary injection.

All are pretty well agreed that, in the nodular type of a syphilitic iritis, which usually occurs during the course of a florid cutaneous eruption, salvarsan acts promptly and at times almost magically. Indeed, there are not a few cases reported in which a definitive cure has been effected in a few days. Of interest in this connection are the observations of Morax and Fourrière. They noted that in cases of iridociliary or choroidoretinal syphilitic lesions which had induced secondary glaucoma and in which tension remained high in spite of miotics and iridectomy, salvarsan effected a rapid resolution of the lesion with a coincident fall in intraocular tension.

Syphilitic lesions of the choroid have yielded readily to the administration of the drug, especially in those cases in which repeated injections have been preceded and followed by intensive mercurialization. It is certain also that retinitis and neuroretinitis of syphilitic origin have in many cases been favorably influenced by salvarsan. Stuelp records that of 76 cases of neuroretinitis treated by salvarsan, a rapid and good result was obtained in 63 per cent., and no result, or a relapse after a primary good result, occurred in 37 per cent.

Opinion is divided as to the efficacy of the drug in specific oculomotor paralysis. Certainly, if all these cases are grouped together, the failures outnumber the successes. The more recent the paralysis the more likely is one to secure a restoration of function.

The earlier trials of salvarsan by ophthalmologists were made with great caution, for all of us had learned to fear possible disaster to the optic nerve following the use of certain of the newer arsenical preparations, notably atoxyl and soamine. There is recorded a number of well-authenticated instances of retrobulbar neuritis eventuating in optic atrophy after the administration of atoxyl, and Ehrlich, fearing a similar untoward effect from arsenobenzol, warned against the use of the drug in any patient showing signs of optic neuritis or retinitis.

It was some time, therefore, before oculists ventured to use the drug in these cases even when fully convinced of the syphilitic nature of the optic nerve inflammation. However, those who ventured into this supposedly dangerous field, were not infrequently rewarded with a satisfactory result, and as there did not appear to be any great danger of arsenical poisoning of the optic nerve, the drug came to be used in these conditions with more and more freedom. It seems to be pretty generally accepted that so long as the neuroretinal lesion is, beyond cavil, of syphilitic origin, salvarsan is indicated, although the best effects are obtained when the drug is associated with mercury and the iodides.

The question of the efficacy of salvarsan in optic atrophy of syphilitic origin is still *sub judice*. The writer presumes that most ophthalmologists will agree with Reese that in spinal atrophy "the administration of salvarsan has apparently hastened the inevitable end." Nevertheless, there are some authors who believe that occasionally salvarsan improves simple optic atrophy, and affirm

that there is no well-authenticated instance of rapid deterioration of vision following the administration of the drug. This view is shared by Dolganoff, who states that arsenobenzol has no deleterious or hastening effect on the degeneration or blindness.

In recent years it has been found that the blood of patients suffering from sympathetic ophthalmia shows a condition similar to that obtaining in protozoal diseases, *i. e.*, a large increase in the mononuclear leucocytes with a corresponding diminution of the polymorphonuclears. Accordingly, Browning and others have used salvarsan in patients suffering from sympathetic ophthalmia. In 17 cases thus treated, the effect of the administration was to reduce the mononuclears nearly to normal with coincident improvement in the eye condition. Relapses, however, were frequently noted, but a second injection again restored the blood to a relatively normal condition, with improvement in the eye. It must be said, however, that Browning's results have not been generally confirmed.

Many cases are on record in which optic neuritis or paresis of the motor nerves of the eye have followed the injection of salvarsan, and the question is being keenly debated whether these affections are, as the name *neurorecidiv* implies, of a syphilitic nature or are evidences of the injurious action of the arsenical drug. There can be no gainsaying the fact that oculomotor paralyses have occurred more frequently since the widespread use of salvarsan than in the days of mercurial therapy. Indeed, a few cases of total ophthalmoplegia have been noted as early as eight weeks after injection. (This condition is exceedingly rare so early in the disease.) Of 370 cases of syphilis treated with salvarsan, 5 showed early ocular muscle palsy, whereas of 5,000 cases of syphilis treated by the older methods only 3 showed this condition. The fact that these palsies have come on about the same time, *viz.*, two or three weeks after the injection, makes one suspect that the drug is the factor. Nevertheless, many of these palsies have cleared up after a second injection of salvarsan, or after a vigorous course of mercury, so that after all the paralysis may be due to syphilis rather than to the drug.

Optic neuritis and neuroretinitis with hemorrhages have been noted in previously healthy eyes following the administration of salvarsan, but in these cases, too, it is generally conceded that the neuritis, which is not a rare episode in syphilitic processes, howsoever treated, is more likely to be due to the spirochætæ than to the drug. In short, therefore, it may be said that should a syphilitic disease of the eye appear after the administration of salvarsan, the indication is to continue vigorous antisymphilitic treatment. There seems every reason to suppose that further injections of salvarsan will aid rather than hinder the reparative process. No doubt some cautious ophthalmologists will not care to run what they may regard as a risk and will prefer to continue the treatment with mercury alone. De Lapersonne and Levi state that there is no need to exaggerate the dangers of salvarsan as regards vision. Contrasting the effect of atoxyl with that of salvarsan, these authors state that "atoxyl may give rise to true subacute retrobulbar neuritis manifested by definite signs comparable with the toxic neuritis, experimental and pathological, due to the effect of quinine, male fern extract, carbon bisulphide, etc. So far no such toxic neuritis has been described following the use of salvarsan." Ehrlich found among

30,000 cases of syphilis treated with salvarsan only one in which a previously healthy eye showed signs of beginning optic nerve atrophy after the injection, and this patient had previously received courses of treatment with atoxyl and enesol, both arsenic compounds.

Ocular Contraindications to the Exhibition of Salvarsan.—Stuelp states that the sole contraindication to the use of salvarsan from the oculist's standpoint is the presence of nonsyphilitic retinitis or optic neuritis. Blanco also believes that the presence of nonsyphilitic ocular disease should be considered a contraindication to the use of the drug. In his experience damage to the ocular structures following the injection of salvarsan is very rare; nevertheless, in view of our still rather limited experience, he demands that the fundus oculi should be examined in every case before treatment. Dolganoff concludes that salvarsan employed in ordinary doses does not act as a poison on the eye as do some other organic compounds of arsenic. Even where the remedy appeared to be contraindicated on account of some pathological condition of the optic disc, its administration did no harm. Experimental observations by Igersheimer tend to prove that in rabbits and dogs salvarsan produces no pathological changes in the retina or optic nerve. Cats, who are more susceptible to arsenic, showed degenerative changes in these tissues after salvarsan injections. Gebb has considered the question of the influence of salvarsan and neosalvarsan on the papillomacular bundle. He noted no toxic effect on these nerve fibres and found that the drug acted favorably when they were involved.

CONCLUSIONS.

Salvarsan, by acting quickly, is of most use in acute syphilitic troubles that threaten the integrity of the eye. Ocular lesions appearing after salvarsan injection should probably be regarded as a further manifestation of syphilis and treated by more salvarsan and mercury. In chronic cases the drug does not do nearly so much good. It does not appear to have any poisonous effect on any of the tissues of the eye. There is certainly no ground for the belief that salvarsan causes atrophy of the optic nerve through a direct toxic effect.

DIAGNOSTIC AND THERAPEUTIC NOTES.

HOT BATHS IN INFANTILE PNEUMONIA.—Arneth (*Deutsch. med. Wochenschr.*, No. 39, 1913). Hitherto the hydrotherapeutic treatment of pneumonia in children has consisted in cool baths, cold packs and cold douches. These procedures, however, presuppose a certain amount of resistance on the part of the little patients, enabling them to react against the cold. The stronger and the older the child, the better the results obtained by these methods. Emaciated, asthenic infants, however, react badly to any such vigorous withdrawal of heat. For them hot baths are much more beneficial. No matter how high their rectal temperature, the skin is either cool or easily chilled, and the application of cold leads merely to a peripheral anemia and a concentration of the heat in the internal organs.

The technique of the hot baths is as follows:—

The weaker the infant and the higher its temperature, the more frequently the hot baths should be given, up to five times daily. The duration of the bath should be ten minutes if the rectal temperature is not over 102° F.; if higher, five minutes. The temperature of the water should be kept constantly at 106° F., hot water being added as required. If heat stagnation sets in, *i. e.*, if the child's skin becomes hot and the head bright red in color or if there is much dyspnea, the bath may have to be interrupted. At the close of the hot bath, the writer uses the cold douche. This should be done as quickly and thoroughly as possible. A cupful of cool water is poured over the child's back, he is dipped into the warm water again, a cupful is poured over the chest and he is quickly dried and clothed.

The results are uniformly good. The breathing becomes deeper and more efficient and the general condition improves. The temperature falls after the lapse of thirty to sixty minutes on account of the better peripheral circulation. The writer states that no one who has seen the good results following hot baths in this condition can fail to become an enthusiastic advocate of the method. He uses it not only in infantile bronchitis, bronchiolitis and pneumonia, but in all other infantile conditions in which the rectal temperature is high while the extremities are cool and the skin pale with livid mottling.

THE FRIEDMANN TREATMENT OF TUBERCULOSIS.—Schleich, Mueller, Thalheim, Immelmann, Kraus and Friedmann (*Berl. klin. Wochenschr.*, No. 45, 1913). At the Charité Hospital in Berlin, an entire evening was devoted to the Friedmann treatment of tuberculosis. The discussion indicates that the treatment and its originator are treated much more respectfully abroad than with

us. Some of the most eminent internists in Berlin are still enthusiastic supporters of Friedmann and his treatment, while Prof. Kraus himself, the director of the second medical clinic at the Charité, is far from hostile.

Prof. C. L. Schleich eulogized this method most highly, showing favorable results as proved by Roentgen plates, and concludes by saying "we have at hand a new weapon with which to fight tuberculosis." Prof. Erich Mueller, of Berlin, reported eighteen cases both of surgical and of pulmonary tuberculosis, each one showing either marked improvement or entire healing as a result of the Friedmann injections. Dr. Hans Thalheim quoted the histories of sixteen more cases, all with equally favorable results. Dr. Immelmann corroborated the statements of the above from observations he has made on *x-ray* plates taken before and after treatment; and Dr. Friedmann added a few words in his own behalf.

Prof. Kraus, one of the heads of the Charité, said that the hospital staff were entirely neutral and unprejudiced; that their own cases had not been observed long enough to allow them to draw conclusions; that he had, however, seen one case improve markedly following the treatment, though he himself had advised against it; and that in conclusion he thought this method was harmless and should be given every opportunity to prove its worth—or worthlessness.

EFFECT OF HOT AND COLD APPLICATIONS TO THE CARDIAC REGION UPON THE CIRCULATION.—Hirschfeld and Lewin (*Zeitschr. fuer phys. und diæt. Therap.*, No. 1, 1914). With an apparatus devised by Lewin, simultaneous records were obtained of the blood-pressure changes in one finger and of the volume changes in another while hot or cold water was flowing through a coiled tube placed over the precordium. The application of cold was immediately followed by a rise in blood-pressure and a fall in the volume of the finger. It was indifferent whether the cold was applied over the heart or elsewhere. The effect was therefore a reflex one, consisting in the production of general vasomotor contraction following the application of cold to any part of the body. Cold applications, not over one-half hour in duration, act only in this manner.

Heat caused an increase in the volume of the finger with a rise in blood-pressure. The result must therefore have been due to an increased cardiac activity. It must also be reflex since the effect is immediate.

They conclude that hot applications rather than cold are indicated when a greatly weakened heart requires stimulation.

INTRAVENOUS INJECTIONS OF SODIUM SALICYLATE IN THE TREATMENT OF RHEUMATIC AFFECTIONS.—Conner (*Med. Record*, February 21st, 1914). To summarize briefly it may be said that, with the proper technique and with a chemically pure preparation of the drug, the administration of sodium salicylate by intravenous injections is safe, painless, and easily performed. So administered, the drug seems to have a much more pronounced analgesic effect than when given by mouth. While it seems unlikely that the in-

travenous method will replace the usual one in the routine treatment of rheumatic fever, it nevertheless has a distinct field of usefulness, the limits of which cannot yet be determined. At present this field seems to include cases in which the drug is not well borne by the stomach; those which show little or no improvement under the usual mode of administration; those with beginning heart complications, and, possibly, cases of severe rheumatic inflammation of the eye.

The size of the individual dose and the frequency of the injections will vary with the requirements of the individual case. In most cases the dose has been either 15 or 20 gr. and the injections have been given at twelve- or eight-hour intervals over a period of from three to six days. Occasionally, in robust men, as much as 30 gr. have been given at a time, and as much as 120 gr. given in the first twenty-four hours without any unpleasant effects whatever.

A NEW DIAGNOSTIC SIGN FOR LESIONS AT THE PYLORUS.—Skillern (*Arch. of Diagnosis*, October, 1913). The pylorus is movable, shifting its position with the degree of distension of the stomach. Nine-tenths of gastric ulcers exist in the pyloric region. A small, circumscribed spot of 'wincing' tenderness is a common sign in gastric ulcer. The situation of the tenderness is frequently a good guide to the site of the ulcer. And if the tenderness is on the right of the midline between the navel and the right costal margin, the probability is that the pylorus is the affected part. Therefore, with the patient reclining and the stomach empty, mark on the skin the site of the 'wincing' tenderness. Now inflate the stomach with air. The pylorus shifts, carrying the spot of 'wincing' tenderness with it. The lesion, then, must be in the pylorus, and not elsewhere. The lesion is probably an ulcer of the pylorus. If the spot of tenderness does not move, the pylorus is either not involved or, if involved, is firmly anchored by adhesions, and these adhesions are due more often to infection of the biliary tract than to pyloric ulcer.

A NEW REACTION FOR SYPHILIS.—Landau (*Wien. klin. Wochenschr.*, No. 42, 1913). The reagent consists of 5 drops of tincture of iodine in 50 c.cm. white paraffine oil. This mixture must always be freshly prepared. The indicator is a clear solution of boiled potato starch. Of the blood-serum, obtained in the usual manner, 0.2 c.cm. are placed in a narrow test-tube, 2.5 c.cm. of the reagent are added and the mixture thoroughly shaken until nearly decolorized. The tube is then closed with a rubber stopper and left lying flat, in a dark place, at room temperature, for two to four hours, after which a few drops of the starch solution are added. Normal sera take on a deep blue color; syphilitic sera remain unchanged. The reaction is apparently due to the presence in syphilitic serum of substances, perhaps fatty acids, that have a strong affinity for iodine, but only in the presence of a lipoid like paraffine. In 77 cases of syphilis, of all kinds, the iodine reaction was positive in 68, the Wassermann test in only 47. All non-syphilitic cases were negative with both tests.

NEURASTHENIA AND PROGRESSIVE PARALYSIS.—Cobb (*Practitioner*, No. 4, 1913). The differentiation between neurasthenia and early stages of paresis often presents difficulties, especially to the general practitioner. Cobb emphasizes the following points of difference:—

1. The neurasthenic seeks the physician of his own accord; the paretic is brought by a member of his family.

2. The neurasthenic has either normal pupils, or dilated ones that react slowly; the paretic's pupils are irregular, contracted and rigid.

3. The neurasthenic readily furnishes a detailed history of his case; the paretic gives no clear information on this point.

4. Loss of memory is characteristic of paresis, rather than of neurasthenia.

A NEW SIGN OF SYPHILIS.—Beck (*Muench. med. Wochenschr.*, No. 50, 1913). One of the earliest signs of constitutional syphilis is a diminished bone-conduction of sound, in spite of otherwise normal hearing. An apparently healthy man, with normal hearing but impaired bone conduction, should be suspected of being syphilitic. A tuning fork is struck and placed on the patient's mastoid process. When he no longer hears it, the fork is placed upon the physician's mastoid region. If the fork is still audible to the physician, the test is positive, provided the patient's hearing was otherwise acute. The reaction is apparently due to increased intracranial pressure. It disappears for a few days after lumbar puncture and is positive not only in syphilis but in brain tumors, hydrocephalus, epilepsy and tetany.

SUBCUTANEOUS INJECTION OF SODIUM BICARBONATE SOLUTIONS.—Magnus-Levy (*Med. Klin.*, p. 2001, 1914). The hypodermic use of sodium bicarbonate solutions has fallen into disrepute on account of their extremely irritating properties. The cause of the latter is not however to be laid at the door of sodium bicarbonate as such, but is due to the fact that, during sterilization, this salt is largely converted into sodium carbonate. The latter may be reconverted into sodium bicarbonate if carbonic acid gas is allowed to bubble through the sterilized solution. The latter is then well borne both subcutaneously and intravenously and is indicated in diabetic coma. A 4 per cent. solution should be used. The writer advocates the preparation of such solutions in sealed flasks with a carbonic acid atmosphere.

TREATMENT OF FURUNCLES.—Berger (*Med. Klin.*, No. 46, 1913). Ichthyol is the most effective healing and analgesic agent in all staphylococcus infections. If it is combined with the antiseptic activity of tincture of iodine an excellent treatment for furunculosis results. The skin over the affected area for some distance to each side is first vigorously painted with tincture of iodine. A gauze compress is then liberally spread with 10 per cent. ichthyol-vaseline (or, in hard furuncles, with pure ichthyol) and applied; then cotton and a bandage. On each subsequent day, the skin is

cleansed with benzine and the procedure repeated. If the iodine proves too irritating, it must be discontinued. The results are said far to surpass those following the usual surgical treatment.

PITUITRIN IN HEART DISEASE.—Beco (*Bull. de l'Acad. Royale de Méd. de Belg.*, Vol. 27, No. 10). The observation of 25 cases of cardiac decompensation treated by means of injections, chiefly intravenous, of pituitrin led Beco to the following conclusions:—

1. Subcutaneous or intramuscular injections of pituitrin are well borne.

2. Intravenous injections, in more than half the cases, are followed by symptoms disagreeable to the patient and alarming to his surroundings. These symptoms are however fugitive and never serious.

3. The cardio-tonic action of pituitrin is slight and fugitive; its diuretic action is non-existent, or nearly so.

4. Compared with digitalis or theocin, pituitrin is inert and has no proper place in the therapeutics of heart disease.

TREATMENT OF BURNS.—Servé (*Deutsch. militär-ärztl. Zeitschr.*, No. 2, 1914). Servé has obtained good results in the treatment of severe burns according to Schoene. The patient is lightly anesthetized (*Aetherrausch*) and the burnt area thoroughly scrubbed with soap and a hard brush, until all necrotic tissue has been removed. The raw area is then washed with alcohol and covered with a dry dressing. The outer layers of the latter are changed daily, the inner layer remaining in place. The advantages of the method are: 1. The immediate disappearance of lymphangitis; 2. A diminished feeling of tension, leading to a preservation of function; 3. Rapid healing with a smooth scar.

THE ACTIVE CONSTITUENT OF BECK'S BISMUTH PASTE.—Rost (*Muench. med. Wochenschr.*, No. 41, 1913). Beck's paste consists essentially of bismuth subnitrate (or subcarbonate) in vaseline, and serious cases of bismuth poisoning have been reported following its use. Rost has found that the bismuth is not an indispensable constituent; identical results follow the injection of ordinary vaseline. The purest vaseline, as well as liquid paraffine are less efficient; crude lubricating grease, on the other hand, causes a tremendous connective-tissue hyperplasia. The best results follow the injection of ordinary yellow vaseline.

THE INTRAVENOUS INJECTION OF DISTILLED WATER IN PUERPERAL SEPSIS.—Ilkewitsch (*Zentralbl. fuer Gyn.*, No. 38, 1913). The intravenous use of distilled water in syphilis has already been noted in these columns. In the Moscow Hospital good results have been obtained from the intravenous injection of freshly distilled water (up to 500 c.cm.) in severe cases of pyemia, septicemia and septi-copyemia. Of 62 cases, 42 recovered. Ill effects, that could be ascribed to the injection, were not observed.

PREVENTION OF CHILD-BED FEVER.—Zweifel (*Wien. med. Wochenschr.*, p. 2799, 1913). The frequency of the occurrence of fever after labor may be reduced to one-fourth of the usual percentage by the routine use of lactic acid douches. For ten successive days, the pregnant woman is given a daily vaginal douche with a one-half per cent. solution of lactic acid. This treatment is especially indicated in pregnant women with pathological vaginal secretions. In the presence of lactic acid the pathological flora of the vagina is gradually replaced by a normal flora. For this reason, lactic acid is to be preferred to any other disinfectant.

In multipara, Zweifel considers a tub bath dangerous, as pathogenic micro-organisms may be washed up into the uterus.

GYNECOLOGICAL HINTS.—Hellier (*Practitioner*, No. 2, 1913). Menstruation is usually diminished in phthisis but increased in cardiac and hepatic disease.

Pain due to uterine disorders usually grows more severe in the course of the day.

No patient who walks about actively and with a firm step, or who throws herself into a chair and then jumps up again, is suffering from a disease of the pelvic organs.

If women with prolapsed or retroflected uterus complain of an exacerbation of their disorder, the existence of pregnancy should be suspected.

EXCLUSION OF THE PYLORUS.—Bircher (*Zentralbl. fuer Chir.*, No. 40, 1913). The permanent closure of the pyloric opening, after gastro-enterostomy, is a difficult matter. Bircher uses the hepatic-umbilical ligament, the remnant of the fetal umbilical vessels, for this purpose. The ligament is separated from the umbilicus and is wrapped tightly around the pylorus, being fixed in this position by means of sutures. As its nutrition remains perfect, it cannot be absorbed, and thus may be trusted to occlude the pylorus permanently.

DIURETIN AND UTERUS.—Stein (*Wien. med. Wochenschr.*, No. 31, 1913). Diuretin causes a dilatation of the peripheral blood-vessels, especially in the abdomen, and may thus lead to uterine congestion. After a moderate dose, the menses may set in early, or a delayed menstruation may make its appearance. In the presence of endometritis, metritis, perimetritis, parametritis, oophoritis, salpingitis or myomata, the congestion following the administration of diuretin may lead to metrorrhagias. In these conditions, therefore, the drug should be used cautiously if at all.

NEOSALVARSAN IN TERTIAN MALARIA.—Baetge (*Muench. med. Wochenschr.*, No. 50, 1913). From the study of 4 cases of tertian malaria treated with neosalvarsan, Baetge concludes that the remedy is a valuable adjuvant to quinine, since it causes an immediate disappearance of the parasites from the blood.

CORRESPONDENCE

LONDON LETTER.

By F. G. CROOKSHANK, M. D. Lond., M. R. C. P.

A very interesting meeting was held last night, under the joint auspices of the Sections of Neurology, Ophthalmology and Otology of the Royal Society of Medicine.

The purpose of the gathering was the discussion of the topic of nystagmus, one of such perennial interest to neurologists, to aurists and to oculists; and yet, in some respects, still surrounded by so much obscurity. A most instructive series of illustrative cases had been collected; and the demonstration of the various phenomena shown by each patient was followed with attention and curiosity. Dr. Wilfred Harris brought a female patient who displayed rapid vertical nystagmus in the right eye only, the left being perfectly and at all times steady. She had a primary optic atrophy of the right disc, apparently of some sixteen years' standing, for her vision has been defective for as many years. No other signs of nervous disorder were obvious, but there was old 'chronic hip-joint disease,' some arthritis of the left shoulder-joint, and the results of old injury and operation in the right shoulder-joint.

The same exhibitor also demonstrated a case of syringobulbia with unilateral nystagmus.

Dr. Cockayne brought examples of familial nystagmus; in one series associated with head movements, and of ambisexual distribution; in another with limited male inheritance only.

In the first group the father and mother were healthy and unrelated; and declared that they knew of no case of nystagmus, hypospadias, or congenital heart disease in any of their respective families, save in their children. Of their seven children, the first, a male, had nystagmus and head movements; the second, hypospadias; the third, nystagmus; the fourth, no defect; the fifth, nystagmus and congenital morbus cordis; the sixth, no defect, and the seventh, nystagmus and hypospadias.

Dr. Cockayne's second group of cases exemplified the occurrence of nystagmus in males, with transmission through the females only. Dr. A. E. Russell showed the rather mysterious case of a healthy milkman, aged eighteen, who in January last complained of headache that lasted a week or two. During this time his comrades noticed that his eyes were 'twitching.' Now the headache has disappeared, and, but for fine tremor of the hands and the nystagmus, which is present in the median position, and becomes coarser on lateral movement, he is well. Perhaps a little tendency to exophthalmos was to be noticed, but nothing else.

The greatest curiosity was evoked, however, by a case shown by Dr. Maddox in which see-saw nystagmus is associated with bitemporal hemianopsia. And it is well worth while giving the details in Dr. Maddox' own words:—

"Mr. F. B., aged fifty-three, carriage builder, four years ago had suprapubic cystotomy for urethral stricture, followed thereafter by slight failure of sight. On February 16th, 1914, the appearance of the eyes when viewed from a distance exactly resembled a see-saw, one always rising as the other was falling. On closer inspection the rising of the right eye and the falling of the left were seen to be accompanied by conjugate parallel torsion to the left; the falling of the right and rising of the left by parallel conjugate torsion to the right. When I held a hatpin horizontally at the level of the lower margins of the corneæ the rise and fall of each eye appeared to be at least 1 mm. The oscillations, both vertical and torsional, are strictly undulatory, with nothing *saccadé* about them. Counting one wheel movement and its return as a period of oscillation, there were 152 such periods per minute on looking straight forward. On looking up, however, the movements became quicker and smaller, and were counted as 204 per minute. The vision of each eye is $\frac{6}{24}$, and is least confused on looking up, showing that the greater amplitude of the excursions is more embarrassing than their greater rapidity. Objects appear to him to move slightly. Diplopia only occasional. Now and then attacks of slight head-nodding are noticeable in the sagittal plane. The left knee-jerk is slightly poor. He has *bitemporal hemianopsia*, with partial inversion of the color fields. There is some reason to believe that this form of hemianopsia has lasted in his case for some years. The horizontal balance of the eyes exhibits only slight exophoria, and there is only slight right hyperphoria, of a degree sufficiently small to be immaterial. There is, however, excyclophoria of 10° .

"This case strikingly confirms the existence of the conjugate parallel torsional innervations 11 and 12, and contrary 3 vertical and 4 innervations, tabulated on page 125 of *The Ophthalmoscope*, No. X, 1912. I have hitherto been unable to furnish more than presumptive evidence as to 3 and 4. It is noteworthy, as proving that conjugate innervations are concerned in this case, that the rising and falling of each eye is exactly the opposite of what an anatomical consideration of the muscles would indicate, since extorsion of each eye is accompanied by a fall of the cornea, though the (extorting) inferior oblique is an elevator, and intorsion by a rise, though the (intorting) superior oblique is a depressor. The see-saw or apparent vertical motion of the eyes in opposite senses is partly an optical illusion due to the greater stretch of visible sclera on the outer side of the cornea than on the inner, but that it is not wholly so is made evident by the experiment with the hatpin and by the rise and fall of the eyelids."

I do not know that any of those present at the meeting had seen any such similar case, or that any complete explanation was proffered.

Amongst other cases that attracted interest was one of post-traumatic deafness, in relation to which the question of malingering had been raised, but disposed of by Dr. Dan Mackenzie's demonstration of the absence of the vestibular reactions in the ear alleged to be affected; and another in which evidence of pressure on the fifth,

sixth, seventh and eighth cranial nerves on the left side, on the left lateral lobe of the cerebellum, and on the pyramidal fibres passing to the right lower extremity, pointed to the presence of a tumor in the left cerebello-pontine angle.

Following the demonstration of cases, Mr. W. T. Holmes Spicer, Dr. James Taylor, and Mr. Sydney Scott read brief papers from the ophthalmological, the neurological, and the otological points of view respectively, each speaker concerning himself, to some extent, with the question of definition. Mr. Spicer defined nystagmus—*tout court*—as an oscillation, or trembling of the eyes. Dr. Taylor adopted the description given by Gowers, to the effect that in nystagmus there is an oscillation of one or both eyeballs due to an alternating activity of opposing muscles, the movement being regular or irregular, horizontal, vertical or rotatory, and evoked on voluntary movement or present when the eyeballs are supposed to be at rest. Mr. Sydney Scott was content to say that he would use the term 'nystagmus' to indicate involuntary oscillatory movements of the eyeballs from whatever cause.

Mr. Spicer, as an oculist, grouped the cases in which nystagmus occurs into, first those wherein there is production of imperfect images by reason of such causes as the consequences of ophthalmia neonatorum, and affections of the retina and choroid in early life. The effect of errors of refraction as a cause of nystagmus he held not quite proved; and, of course, he laid stress on the important part played by defective pigmentation in the bringing about of nystagmus. He pointed out how this pigmentary defect may be most evident in the retina, in the iris, or in the choroid, although it is probably the condition of the retinal epithelium that matters most.

Mr. Spicer thinks that it is as yet impossible to say whether or no in cases of hereditary nystagmus there is defect of the retinal epithelium; and, of course, little is known of the pathological conditions underlying those rare cases of day blindness in which, together with a certain amount of amblyopia and defective color perception, there is sometimes nystagmus.

In respect of occupation nystagmus, Mr. Spicer inclines to the notion that bad fixation is the primary cause.

He alluded, in conclusion, to some of the less well-known forms of nystagmus, such as that said to be (rarely) associated with the abuse of coffee; and the syndrome, described by Lenoble and Aubineau under the name of 'myoclonic nystagmus' in the *Revue de Médecine* for 1911, as common in parts of Brittany.

Dr. Taylor, speaking as a neurologist, discussed the mechanism of the various phenomena, and went on to enumerate the various diseases in which it occurs, insisting on its relation to the slighter forms of syringomyelia, to local lesions in the vicinity of Deiter's nucleus, and to conditions of polio-encephalitis.

But he also declared his belief in the observation of Dr. Thomas Buzzard, made many years ago, to the effect that in cases of alcoholic neuritis nystagmus may occur.

He believes apparently that what have been called 'nystagmoid jerkings' may be the result of purely peripheral changes, and that definite nystagmus may ensue later when the central mechanism becomes involved. In this manner possibly the association of nystagmus with ocular troubles may be explained.

Mr. Sydney Scott, in an able contribution to the debate, dis-

cussed the theory of labyrinthine nystagmus, its induction by excessive stimuli of the semicircular canals; and the technique of the various tests now employed. He reiterated the law which he just enunciated in the Arris and Gale lectures for 1910, when he used these words: "The deviation of the head and eyes is in the same direction as the current in the endolymph, and the nystagmus in the opposite direction." Finally he suggested the possibility of estimating and recording degrees of vestibular activity by elaborating certain methods. Thus in rotating he would ascertain the minimal number of rotations at a constant rate that induce nystagmus; in the caloric method, he employs always a constant temperature of the water, by measuring the quantity of water used before nystagmus is recognized, and the extremes of temperature that may provoke it; and, with the galvanic method, he observes the amount of current, in milliamperes, that is needed in order to produce the manifestations.

The debate is to be continued next week, and, when the speeches have been finally revised and reported, the records, in the Proceedings of the Society, cannot fail to give a very complete conspectus of our state of knowledge and of our present views on this deeply interesting subject.

February 27th.

BOOK REVIEWS.

A SYSTEM OF SURGERY. Edited by C. C. Choyce, B. Sc., M. D., F. R. C. S., Dean of, and Teacher of Operative Surgery in, the London School of Clinical Medicine (Post-Graduate); Assistant-Surgeon to the Seamen's Hospital, Greenwich, etc. etc. Pathological Editor, J. Martin Beattie, M. A., M. D., C. M., Professor of Pathology and Bacteriology, and Dean of the Faculty of Medicine, in the University of Sheffield, etc. In Three Volumes. Volume I. With 16 Colored Plates, 64 Black-and-White Plates, and 250 Illustrations in the Text. Volume II. With 18 Colored Plates, 8 Black-and-White Plates, and 375 Illustrations in the Text. New York: Funk and Wagnalls Company. 1912. Price, \$7.00 per volume; \$21.00 per set.

The first volume takes up general surgery and pathology of surgery. It is not the stereotyped discussion one usually finds in the systems of surgery, but gives in detail the whole of the pathological side in a most interesting and certainly most thorough manner. The section dealing with anesthetics is not so satisfactory as other parts of the book, but undoubtedly reflects English ideas. One is rather surprised to read that chloroform-ether mixture is recommended for inexpert administration, and to find that nothing is said of the intratracheal method now so generally used where there are definite indications for it.

The second volume is given over to the breast, the tongue, the mouth, gastro-intestinal and genito-urinary surgery. The section on the breast is by Mr. Handley and is most complete and covers the pathological side particularly well. Another most excellent chapter is by Clayton-Green on the tongue. It is hardly necessary to review the separate chapters of the work, which are all most thoroughly developed and are interesting in their treatment. One is pleased to note the excellent illustrations and the general appearance of the work.

DISEASES OF THE EAR. By Philip D. Kerrison, M. D., Professor of Otology, New York Polyclinic Medical School and Hospital, etc. etc. 331 Illustrations in Text and 2 Full Pages in Color. Philadelphia and London: J. B. Lippincott Company. 1913. Price, \$5.00.

One who has personally followed the progress of modern otology for the past ten years, endeavoring to keep pace with its rapid strides and perhaps to contribute something from personal observation and investigation, is perhaps inclined to forget the starting point of his journey; to forget the place of embarkment in his enthusiasm at the speed of the current and the scenery along its banks. If he has acquainted himself with modern otological literature, in periodicals or monographs, he is possibly oblivious to the fact that up to the present there has existed no modern, authoritative work on the subject in the English language. So it would seem that the author, as stated in his preface, is quite justified in producing still another work on the subject. To quote: "The wholly new field of work which has been opened to us by the successful investigation of the static labyrinth; the new light upon syphilitic lesions of the labyrinth and auditory nerve, resulting from the recent world-wide renewal of interest in the study of all phases of syphilis; and the investigations still in progress as to the influence of autogenous vaccines and leucocyte extracts upon certain phases of aural disease,—these and other additions to our knowledge have suggested new problems, in the working out of which laboratory investigations have been closely followed by practical therapeutic results.

"In aural surgery our activities can no longer be confined to the narrow limits of the tympanum and mastoid process, but must include the more hazardous field of intracranial surgery and the yet more delicate and difficult work upon the auditory labyrinth itself. There is, then, some justification at the present time for yet another book,—i. e., an attempt to present the complex subject of otology in the light of recent advances."

The author by training and experience is peculiarly well qualified to undertake the work in question, and has accomplished the task both with credit to himself and to the American profession of which he is a distinguished member. The style is clear, terse and distinct, leaving no doubt as to the meaning intended. The illustrations are profuse, well chosen and illuminating. The divisions into the various chapters and parts are logical. Some statements may at times seem a trifle dogmatic and at variance with the more accepted positions and teachings on the subject. In the latter instance, his own reasons for his position are carefully given, while due mention is given the views of others, the reader being left to draw his own conclusions. Such an attitude can hardly be considered a fault. The book is an excellent work of reference for the otologist and the practitioner.

The word 'manual' we hardly consider appropriate for such a volume. With the demands of the modern medical curriculum, we doubt if a work so voluminous and comprehensive in character would be well suited to the needs of the undergraduate student.

RESEARCHES ON RHEUMATISM. By F. J. Poynton, M. D. Lond., F. R. C. P. Lond., Vice-Dean of University College Hospital Medical School, etc. etc., and Alexander Paine, M. D. (State Medicine) Lond., D. P. H. Eng., Director of the Cancer Hospital Research Institute London. With Frontispiece in Color and 106 Illustrations. New York: The Macmillan Company. 1914. Price, \$5.00.

The authors have collected in this volume the chief papers bearing upon a research on the subject of rheumatism which has extended over a period of fifteen years. With the exception of the first few papers, written before their discovery of the *diplococcus rheumaticus* in 1900, the bulk of the volume has for its central feature a study of the clinical, experimental and bacteriological behavior of this micro-organism. If, as now seems probable, the position of this *diplococcus* as the etiological agent in the group of rheumatic diseases comes to be established, the book will rank as a classic in English medicine.

One aspect of the subject of acute rheumatism worthy of attention and brought into prominence by these papers is the variety of lesions produced by the infection. It would seem that it is not only the joints, the pericardium and the endocardium that are subject to its invasion, but that it may be responsible for a bronchopneumonia, a nephritis, a peritonitis or an appendicitis. The recent publications of Rosenow lend additional weight to these conclusions.

The book is luxuriously gotten up in accordance with the high standard we have come to expect from the publishers; it is profusely illustrated and its value is doubled by an adequate index.

SURGICAL DISEASES OF CHILDREN. By Samuel W. Kelley, M. D., LL. D., Honorary Professor of Surgical Diseases of Children, Medical Department, National University, St. Louis; Pediatricist and Orthopedist, St. Luke's Hospital, Cleveland, etc. Illustrated. Second Edition, Revised and Enlarged. New York: E. B. Treat and Company. 1914.

It is difficult to put a fair estimate upon this work of Kelley, for the reason that though inclusiveness merits commendation, yet as a result of its broad scope it perforce deals unsatisfactorily and scantily with subjects of importance. If we exclude the chapters on rickets, separation of the epiphyses, paralyzes of childhood, and club-foot, we have left some twenty odd chapters that differ very little from similar chapters in works on general surgery. Indeed, Kelley has seen fit to include material that has no place in general works on surgery and just as little place in a special work on the surgery of infancy. For example, three pages are devoted to the detailed technique of the Wassermann test for syphilis, and another two pages to the determination of the opsonic index of the blood. On the other hand, one looks in vain for a satisfactory discussion of the symptomatology and treatment of intracranial hemorrhage of the newborn, and of the diseases of the breast in infancy and adolescence. Under the section devoted to tuberculosis of the cervical lymph-nodes, totally inadequate mention is made of tuberculin, which we know is practically a specific in suitable cases. We feel that the value of the work would have been greatly enhanced by lending to it a bit more of the personal element, and also by a more selective discrimination in the choice of subjects and topics.

CASE HISTORIES IN PEDIATRICS. A Collection of Histories of Actual Patients Selected to Illustrate the Diagnosis, Prognosis and Treatment of the Diseases of Infancy and Childhood, With an Introductory Section on the Normal Development and Physical Examination of Infants and Children. By John Lovett Morse, A. M., M. D., Associate Professor of Pediatrics, Harvard Medical School, etc. etc. Second Edition. Boston: W. M. Leonard. 1913. Price, \$5.50.

The second edition of Dr. Morse's valuable book opens with an added chapter on the normal development and physical examination of infants and children. In this section will be found many practical points clearly and succinctly stated.

The number of cases in the body of the book has been doubled. Two hundred illustrative cases are tabulated, covering the entire field of pediatrics. An excellent index permits ready reference to individual subjects, and obviates the necessity of stating the diagnosis in advance of each case.

For the student the value of the book is thus enhanced, because the problems of diagnosis can thus present themselves to the mind in the findings as given, without the bias of a diagnosis made in advance. The discussions of the physical signs and symptoms are full and carefully worked out. The case-teaching method has come to stay, and this book of Morse's is one of its best examples and a really valuable contribution to contemporary pediatric literature.

GUNSHOT INJURIES. How They are Inflicted, Their Complications and Treatment. By Colonel Louis A. Lagarde, United States Army Medical Corps (Retired), Late Commandant and Professor of Military Surgery, U. S. Army Medical School, etc. etc. New York: William Wood and Company. 1914. Price, \$4.00.

This volume discusses in great detail, practically every phase of the surgery of war. A preliminary chapter clears the ground thoroughly by describing the various firearms, explosives, projectiles and ballistics. The following chapter discusses the types of lesions produced by the various projectiles, and makes clear the stopping power, shock, and explosive effects of the different kinds of bullets. Chapters 3, 4, and 5 discuss in order the symptoms of gunshot wounds, the infection of gunshot wounds, and the treatment of gunshot wounds. From here on, the author adopts an anatomical classification, and discusses gunshot wounds of the head and face and neck, spine, chest, abdomen, blood-vessels, bones, and joints. The two closing chapters take up the medicolegal phases of gunshot wounds and field x-ray apparatus.

Naturally, a volume of this description discusses many subjects that are more or less foreign to the civil surgeon; but for the most part, the civil surgeon, particularly he who serves in any of the larger municipal hospitals, will find the book a valuable guide in his everyday routine emergency work. The style is clear, the descriptions and case histories lucid, and the illustrations uncommonly well selected. On the whole one may sum up by saying that this volume is the first good and extensive exposition on gunshot injuries that has appeared in America, since the war reports of the Rebellion.

DYSENTERIES, THEIR DIFFERENTIATION AND TREATMENT. By Leonard Rogers, M. D., F. R. C. P., B. S., F. R. C. S., C. I. E., I. M. S., Physician to the Isolation Ward (Cholera and Dysentery) Medical College Hospital, etc. etc. New York: Oxford University Press. 1913. Price, \$3.75.

Probably no one is better able to write upon the subject of dysenteries than the author of this monograph, who has devoted so many years to the study of the subject and to whom we are indebted for so much of our better understanding of this chapter in medicine. It is in great part through the work of Rogers that amebic dysentery has come to be recognized as a distinct clinical entity; and it is also largely through his efforts that the specific value of ipecac in this form of dysentery has been generally conceded. More brilliant still was his discovery that the active principle of ipecac, emetine, is a much more potent remedy than the crude drug, and that it can be used hypodermically with good results in cases too far advanced to respond to ipecac. One need scarcely say then, that this work contains the most advanced and authoritative presentation of the subject, and while some of the views concerning the classification of the pathogenic amebæ will probably have to undergo revision, the work as a whole will stand as a lasting monument to the keen and interesting efforts of the author.

THE DIFFICULTIES AND EMERGENCIES OF OBSTETRIC PRACTICE. By Comyns Berkeley, M. A., M. D., B. C. Cantab., F. R. C. P. Lond., M. R. C. S. Eng., Obstetric and Gynecological Surgeon to the Middlesex Hospital, etc. etc., and Victor Bonney, M. S., M. D., B. Sc. Lond., F. R. C. S. Eng., M. R. C. P. Lond., Assistant Obstetric and Gynecological Surgeon to the Middlesex Hospital, etc. etc. With 287 Illustrations. Philadelphia: P. Blakiston's Son and Co. 1913. Price, \$7.50.

In a volume of 750 pages the authors consider with much detail all the various difficulties and emergencies which the practitioner may meet with in his obstetric work. The indications and the technique of all obstetric manipulations and operations are described very clearly and are most satisfactorily elucidated by very good illustrations. But it would seem that the chief value of this work lies in its first twelve chapters devoted to a thorough consideration of the complication of pregnancy and labor with diseases outside the genital tract. Probably in no other work, written in the English language, has this very important problem of the association of disease to the puerperal state been dealt with in so exhaustive and complete a manner.

PATHFINDERS OF PHYSIOLOGY. By J. H. Dempster, A. B., M. D., Editor of the *Detroit Medical Journal*; Formerly Lecturer in Physiology, *Detroit College of Medicine*, etc. etc. Detroit: The *Detroit Medical Journal Company*. 1914. Price, \$1.00.

This small volume represents an interestingly discursive set of what might properly be termed essays on historical topics and characters related to the development of physiology. Instead of serving his material in essay form, however, Dr. Dempster has grouped it under the head of chapters, dealing with William Harvey and His Discovery of the Circulation, The Physiology of Digestion in the 17th and 18th Centuries, The Physiology of Digestion—William Beaumont, The Glycogenic Function of the Liver, Vasomotor Nerves—Claude Bernard, Respiration, The Nervous System, and The Cell Theory.

There is nothing in any of these chapters that betokens any intensive study of original sources, and yet, as a whole, the little book makes for an hour's pleasant reading. To the friends of the late Dr. Jesse S. Myer, there is no little gratification to be derived from the full measure of recognition accorded to the excellent volume on Beaumont written by Dr. Myer just before his death.

THE HEALTHY MARRIAGE. A Medical and Psychological Guide for Wives. By G. T. Wrench, M. D., B. S. (Lond.), Past Assistant-Master of the Rotunda Hospital, Dublin, etc. etc. New York: Paul B. Hoeber. 1913. Price, \$1.50.

The evident desire of the modern woman for better information concerning her sex function has led to the publication of several volumes presenting this information in a form and language free of scientific details and terms. This new volume belongs to this group, and undoubtedly represents a very acceptable type of work of this kind. The author's views and statements are scientifically correct, but often somewhat out of harmony with sociological or ethical standards prevailing in this country. The American woman will not like the writer's suggestion to women with advanced ideas not to marry, will not agree with his rather pronounced feeling of woman's physical inferiority; and the American physician will probably object to the strikingly frequent reference to the value of certain patent or secret medicines.

FRACTURES AND DISLOCATIONS. A Practical Treatise. By Lewis A. Stimson, B. A., M. D., LL.D. Seventh Edition, Revised and Enlarged. With 459 Illustrations and 39 Plates. New York and Philadelphia: Lea and Febiger. 1912.

This well-known standard textbook on fractures and dislocations needs no introduction to the medical reader. Its pages are full of familiar and important expositions on the subjects included within its scope. Any surgeon or practitioner needing aid or advice will turn first to this volume and will there find standardized and well-matured counsel. The present edition represents a work passing into well-merited and honorable years of service, fulfilling a definite purpose and supplying a positive need. Mention of the salient points covered by a work so well known as is this one would be superfluous; hence the reviewer will confine himself to the statement that in its present form the book retains its high character as well as its devotion to detail, an important matter in medical literature.

THE EARLY DIAGNOSIS OF TUBERCLE. By Clive Riviere, M. D., F. R. C. P., Physician to Out-Patients, City of London Hospital for Diseases of the Chest, Victoria Park, E., Physician, East London Hospital for Children, Shadwell, E. New York: Oxford University Press. 1914. Price, \$2.00.

Public demand for the suppression of tuberculosis has called attention to the need, hitherto somewhat neglected, for study on the part of the profession of all measures directed to its early diagnosis. Especially urgent is the call for the detection of such forms as are common, and tend to the spread of disease, and that at a stage when the condition is still within reach of arrest or cure. In the present volume the writer has confined his attention, so far as possible, to this requirement, and attempts to supply the essential elements of diagnosis in the two conditions where it seems most urgently needed—in early pulmonary tuberculosis of adults, and in tuberculosis of thoracic glands and hilus tuberculosis in children.

In each, early detection may save the individual as well as the community from danger, since it may lead to the prevention of 'open' lung disease through which the germ is likely to be spread. The skill required for the early diagnosis of tubercle is, unfortunately, difficult and laborious to acquire, and no short cut to it does, or ever can, exist—the path of experience must be duly trod. The way can, nevertheless, be greatly smoothed by a careful piecing together of the scattered stones of knowledge over which the journey lies, and this has been attempted in the present book.

DISEASES AND DEFORMITIES OF THE FOOT. By John Hoseph Nutt, B. L., M. D., Surgeon-in-Chief, New York State Hospital for the Care of Crippled and Deformed Children, etc. etc. Illustrated. New York: E. B. Treat and Company. 1913. Price, \$2.75.

This small volume is prepared as a handbook for the use of physicians who have not had time or opportunity for a thorough study of the oft-neglected subject of the human foot, its diseases and deformities, and who keenly feel their inability to prescribe scientifically and successfully for the many who consult them regarding their pedal symptoms.

The Anatomy and Physiology of the Foot are the most interesting chapters to the orthopedic surgeon.

On the whole, it is a very pleasing volume and contains in simple form many points that are of value, not only to those for whom it is written, but to the specialists in this division of surgical practice.

DISEASES OF THE DIGESTIVE CANAL (ESOPHAGUS, STOMACH, INTESTINES). By Dr. Paul Cohnheim, Specialist in Diseases of the Stomach and Intestines in Berlin. From the Second German Edition. Edited and Translated by Dudley Fulton, M. D., Assistant Professor of Principles and Practice of Medicine, University of California College of Medicine, Los Angeles Department, etc. etc. Illustrated. Third Edition. Philadelphia: J. B. Lippincott Company. 1914. Price, \$4.00.

The rapid exhaustion of the first two editions of Dr. Cohnheim's book speaks more eloquently than could any review to prove that the work meets a distinct need of the American physician doing general practice, and meets that need satisfactorily. The changes in the present edition are minor, being, in the main, slight additions to the chapters on diseases of the pancreas, and peptic ulcer. The translator has again incorporated within brackets such additional paragraphs of his own as seem timely and pertinent.

IONIC MEDICATION. The Principles of the Method and an Account of the Clinical Results Obtained. By H. Lewis Jones, M. D., F. R. C. P. Lond., Consulting Medical Officer to the Electrical Department in St. Bartholomew's Hospital, etc. etc. Second Edition. Philadelphia: P. Blakiston's Son and Co. 1914. Price, \$1.50.

Ionic medication is a method of treatment in which electric currents are used for their power of setting the constituents of a saline solution in ordinary motion in a definite direction. It is used for the introduction of drugs into the superficial parts of the body through the surface and also for modifying the chemical constitution of some of the deeper tissues.

At present, the real value of the method is still *sub judice*. The best results have apparently been gained in superficial affections, but there is reason to hope that equally good results may be obtained in moderately deep-seated affections such as tenosynovitis.

DIE MORPHOLOGIE DER MISSBILDUNGEN DES MENSCHEN UND DER TIERE. Ein Lehrbuch fuer Morphologen, Physiologen, Praktische Aerzte und Studierende. II. Teil. Die Doppelbildungen. Von Dr. Ernst Schwalbe, A. O. Professor der Allgemeinen Pathologie und Pathol. Anatomie an der Universitaet Heidelberg. Mit 2 Tafeln und 394 Z. T. Farbigen Abbildungen im Text. Jena: Verlag von Gustav Fischer. 1907. Price, 11 m.

On a former occasion the scope of this work was set forth. In its entirety it will represent the most complete elaboration of the problem of malformation ever attempted. In this second volume Schwalbe discusses the question of double monsters. It is obvious that the volume reflects not only the original researches of its distinguished author, but considers in a most careful and complete manner the entire literature on the subject, and gives descriptions and illustrations of all observations heretofore recorded.

A HANDBOOK FOR THE POST-MORTEM ROOM. By Alexander G. Gibson, D. M. (Oxon.), F. R. C. P. (Lond.), University Demonstrator in Pathology, Oxford, and Honorary Assistant Pathologist to the Radcliffe Infirmary, Oxford. New York: Oxford University Press. 1914. Price, \$1.50.

This is an excellent little book and can be recommended to any physician who has to do an occasional autopsy. The author does not attempt to crowd a textbook of pathologic anatomy into this manual as has been done too often in books of this sort, but confines himself to his subject. The technical descriptions are concise and well written. In some instances there are departures from the classic German methods, but these are in general of slight consequence.

The book is printed in distinct type on good paper and is of convenient pocket size so that its use in the autopsy room is practical.

A TEXT-BOOK OF MIDWIFERY FOR STUDENTS AND PRACTITIONERS. By R. W. Johnstone, M. A., M. D., F. R. C. S., M. R. C. P. E., Assistant to the Professor of Midwifery in the University of Edinburgh; Physician Accoucheur, New Town Dispensary, etc. etc. Contains 264 Illustrations. New York: The Macmillan Company. 1913. Price, \$3.25.

In a very exact and clear form this small volume presents the important facts of practical obstetrics. The arrangement of the text and the careful selection of the numerous, mostly diagrammatic illustrations make this new work especially valuable as a textbook for students.

MANUAL OF SURGERY. By Alexis Thomson, Professor of Surgery, University of Edinburgh; Surgeon Edinburgh Royal Infirmary, and Alexander Miles, Surgeon Edinburgh Royal Infirmary. Volume Third. Operative Surgery. Second Edition. With 255 Illustrations. New York: Oxford University Press. 1913. Price, \$3.50.

Some time ago we reviewed the first edition of this third volume and in the new edition very little has been changed. Some few operations have been added and there have been a few changes in the text. As a handy reference book it is very serviceable.

GOUT: ITS ETIOLOGY, PATHOLOGY AND TREATMENT. By James Lindsay, M. D. (Edin.), M. R. C. P. (Lond.), Hon. Physician, Formerly Hon. Pathologist, and Res. Med. Officer Royal Mineral Water Hospital, Bath. New York: Oxford University Press. 1913. Price, \$1.50.

A small book of some two hundred pages containing the author's personal experiences with about six hundred cases of gout. The author has adopted the plan of Strangeways, of Cambridge, in arranging his statistics on etiology. The most interesting chapter is on the chemistry of gout. The book is well written and illustrated.

THE ELEMENTS OF BANDAGING AND THE TREATMENT OF FRACTURES AND DISLOCATIONS. By William Rankin, M. A., M. B., Ch. B., Dispensary Surgeon, Western Infirmary, Glasgow, Extra Honorary Assistant Surgeon, R. H. S. C., Glasgow. New York: Oxford University Press. 1913. Price, \$1.50.

Another little book on bandaging—this one from Glasgow. The volume contains about the same statements and illustrations as do our own little books on this subject. It is a good book for a surgical interne or surgical nurse.

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EDITORIAL.

THE REVOLT OF THE MODERN CHILD.

To say that the modern child is in a state of revolt would be exaggerating matters, but to say that it ought to be would be stating only an undeniable fact. In what period of history has the child been subjected to so rigorous a system of education as the one in force at present, and in what period of history has so much been expected of the youthful product? Of course, it is well in its way to say that the child is father of the man and that if the right sort of education is not given him, a manhood, that might have been decorative and useful, will be destroyed. But even admitting this, are we justified in our present attitude towards the child, are we not over-enthusiastic in regard to our educational methods, and are we not as educational stokers filling youthful engines with more fuel than is good for them? We think so; and just because we are firm in our opinion and are fearful as to the future, we would welcome a revolutionary outbreak on the part of the modern child so that a salutary lesson would be taught all those zealous educators, be they medical or lay, who have repeatedly ducked the weary little heads into the muddy waters of complicated problems in the hope that what is none too well understood at forty will be at once grasped at ten.

It may be contended by the readers of this column that to preach revolution is unbecoming the dignity which should be the best asset of a medical journal, and that the earnest endeavors of men and women, who have made a close study of what the modern child should know, merit much better treatment than denunciation. While all this is true, so unkind and so unsympathetic have been the various attitudes toward the modern child by all advanced educators that commination is about the only form of criticism which can be visited upon them, if the critic desires his remarks to be effective.

Let us take up, in the first place, all this modern balderdash on the subject of sex education. That the child should know that there are two sexes is right and proper, and that it should know some of the laws of sexual life as taught by the parents and not by the teachers cannot but meet with approval. But that it should know the nastiness of the sexual life of man, not because the teacher gives forth the information in a nasty way, but because he or she must necessarily distort since the whole truth cannot be told, is an attack on the innocence of childhood that will leave indelible marks that will militate against the sanity of one's views later on, for it cannot be denied that with the knowledge that is drummed into the youthful heads, priggishness will supplant boyishness, and what is still worse, since the period of manhood is much longer than that of boyhood, this attractive quality will be lacking during all those active and strenuous years when the leaven of boyishness is really necessary in vanquishing ordeals. But the medical educators, if would seem, do not concern themselves with manhood as defined in the old-fashioned way; all they desire is that the boy should know that his sexual organs require deep cogitation on his part, otherwise they will misbehave: proving beyond a doubt that truism of all truisms that if you think continually on sexual matters, a quiescent state will be effected!

But if our medical educators have run amuck in their enthusiasm to tell the young all that they learned during their adult life, how shall one describe the methods advocated by the lay educators so that the modern child can master the problem of how to live each moment of the twenty-four hours in such wise that not one is wasted, educationally speaking? In a book before us, "The Education of Karl Witte" (Thomas Y. Crowell Company, New York), there is an interesting description of one of those wonder-children who are either remarkable linguists, musicians or mathematicians long before the normal child really awakens to the fact that education is a very important matter in life. Now this book has not been translated from the German by Professor Leo Wiener and edited by Mr. H. Addington Bruce to show what an extraordinary child accomplished in the educational line almost a hundred years ago, but as a tract to convince parents and educators of to-day that if they will follow the methods which Pastor Witte invoked to make of his son a being of remarkable development ("when he was nine, according to his father's statement, he had read Homer, Ossian, Fénelon, Florian, Metastasio, besides Schiller and other German writers" and "in 1814, before he had passed his fourteenth birthday, he was granted the Ph. D. distinction, and two years later, at the age of sixteen, was made a Doctor of Laws, being also appointed to the teaching staff of the University of Berlin"), surprising results will be achieved. To strengthen his position, Mr. Addington

Bruce mentions in the Introduction those other educational marvels—Norbert Wiener, William Sidis, Lina and Adolf Berle, and Winifred Sackville Stoner; but in doing so he fails of his object, for there is no gainsaying that these children were decidedly above the ordinary and that, though their parents were highly intelligent guides, their progress would not have been so noteworthy had their mental equipment been less. But even though what has been stated by us could invite controversy, what is clear of all argument is that a book of this sort is of very little value in this country at the present time, for the methods, though they may be revived by a few, cannot be accepted by the majority, since the German idea of education is too disciplinary to be pleasing to the American educator. In writing 'the American educator' we should have said the American child, for the saddest thing to contemplate in our educational circles to-day is the aping of German school methods by our male and female educators, as if it were possible to saddle upon the American child the discipline that even in Germany to-day is receiving broadsides of criticism from highly intelligent people. And since it is a fact that in no other country does child-suicide reach the high figures which it does in Germany, it would be well for all American educators to be most careful in their attacks on the youthful mind, for it may happen that in their frenzy to be modern they might develop into brain-tissue destroyers instead of brain-tissue builders. There is no doubt that when the drunken father of Beethoven returned from the tavern late at night, accompanied by Pfeiffer, a teacher who lived with the family, and both assisted at the ceremony of taking the sleepy child out of bed and making him practise until morning, they followed their own ideas of discipline and thought they were educating the boy on the right lines, when in reality they were doing their best to make him sullen and recalcitrant. But in Beethoven's case genius triumphed over a distorted prosecution of parental prerogative, and the result was the immortal Ninth Symphony and the Mass in D. But suppose the child had been less gifted? Is it not possible that instead he would have sung the Marseillaise or *Ca ira*?

P. S.

A NEW SORT OF OUT-PATIENT: THE HEN.

There has recently happened in England an occurrence that is fraught with the greatest importance as regards the proper conduct of a hospital supported by almoners. Some weeks ago a small boy brought a hen, that was suffering with a broken leg, to the out-patient department of the Bolingbroke Hospital, and the kind-hearted and sympathetic house surgeon attended the hen without thought to the fact that he was employed in a hospital that

was being supported by private contributions, and not in a Poor-Law infirmary. Now the question that is agitating *The Hospital* (London) is whether he had a right to do this free of charge, and if it would not have been showing greater respect to the almoners had he insisted on the small boy paying; for the small boy really intended buying the hen, hence must have been in possession of money. A bold, bad precedent this, for it might lead to patients frequenting the out-patient department, now that the hen has received such humane treatment free of cost, and insisting on the same privileges despite what the almoners may think of this sort of an invasion. But what should not be overlooked in the case of the injured hen, gravely remarks the writer, is that it was a casualty case and "first, it is clear that aid must be rendered, abuse or no abuse, to casualty cases, even if, as in the case of the hen, there is no doubt of the ineligibility of the patient if the letter of the regulations is to be observed; and, secondly, that humanity and considered help for patients, however troublesome in themselves, and indeed irregular, are still more economical in the long run than any mere saving system."

The incident which we have related may strike the reader at first as of no moment, and moreover so peculiarly British that its applicability in this country is almost nil. In thinking thus he will be greatly in the wrong, for if he has ever given serious thought to the conduct of our hospitals and how inhospitable they are to casualty cases, and for that matter to all patients unless they lay siege for admission armed cap-à-pie with documents from some official of high standing whose 'influence' counts for much in getting favorites into a hospital as 'charity' cases, he must be aware that though the world is very large indeed, the ideas which govern the manner of conducting a hospital are quite of the same family, no matter what the number of miles between two institutions, or the nationality or indigenous prejudices of the officials. This drastic criticism may be objected to, and no doubt will be, by those who think but lightly on the subject, or who are so engrossed with their exalted positions on hospital boards that they have but poor interpretative powers, especially in regard to the correct definition of the word charity. But even though we are willing to admit a slight exaggeration, this does not detract from the truth of our statement. Casualty cases receive the right sort of treatment provided a deal is known of the injured person, or the policeman accompanying him to the hospital can supply the data required; but in all our cities the injured person, in case he is of the lower walks of life or bears the badge of the outcast, is invariably sent, not to the nearest hospital, but allowed to lie on the pavement until the ambulance arrives to take him on a lengthy trip over miles of streets that are none too smooth to the city hospital. And this is

done not because the policeman is inhuman, or the bystander heartless, or the owner of the shop or factory, in which the accident occurs, devoid of feeling, but because, as is often the case, the nearest hospital is a 'private' institution where even the possibility of a case turning out to be a charity one fills the Superintendent's room with a buzz of conversation.

If what has just been said is the truth, at least as we see it, it can readily be understood by the reader that the hen story is not such a foolish one after all. That the incident occurred in England and not in this country is very fortunate indeed, for had it happened here no thought would have been given the matter, since we are too busy with our own little affairs to recognize the true significance of whether a hen should be treated as a charity case or a fee be exacted from its owner. But since we get so many of our practical ideas from England, let us hope that this little hen story will bear fruit with us, and that the next time a casualty case, that is unmistakably 'charity,' occurs in close proximity to a 'private' hospital, the stranger will be taken in on the strength of the humane treatment accorded a hen in an English hospital.

P. S.

OPINION AND CRITICISM.

THE SOCIAL STATUS OF THE DENTIST.

There are perhaps no two countries in the world where the social conditions are the same and especially where professional men enjoy the same degree of social recognition. In Germany, for instance, the man who can attach the title of professor to his name stands head and shoulders above the most celebrated literary man or painter who has seen fit to turn his back on academic honors, no matter whether the professor is a dryasdust product and the writer or painter a man of genius. Who has not smiled because of the great significance the Germans attach to the title of Herr Professor, or has not been tickled into uncontrollable laughter by the assumption of the professor's honors by his worthy wife, who not only insists on servants using the title when addressing her, but demands full recognition from her acquaintances! If we wander to France a complete change greets us, and the literary man, the artist and others who have done outstanding work rank much higher socially than the professor, be he ever so well known, not because the French are not a highly educated people, but because they worship at the shrine of genius and are about the only people who are capable of recognizing this rare quality, despite what Bernard Shaw says of them in regard to their neglect of Brieux and Rodin. And in England, is it not a fact that the untitled physician or surgeon is a negligible quantity, socially speaking? And in this country are we not already bestowing a title on the surgeon, and making much of other foolish distinctions, such as the reversal of what obtains in England to-day: the placing of the surgeon above the physician? But in all countries the dentist fares worse than any other professional man, and though his preliminary education—and now we are speaking of the United States—has been acquired in a school of considerable standing, directly he gets his degree in dentistry the social ban is placed upon him by the merchant, the banker and even by the majority of physicians and, of course, by all the surgeons.

No doubt there will be some readers who will attempt to controvert our statements by recalling the historic occurrence of the ex-Empress Eugénie fleeing to Dr. Thomas Evans, the American dentist in Paris, for protection against the angry mobs after the battle of Sedan, and with what gallantry he escorted the Empress of the French through the crowds until she was out of harm's way, thus

showing that the social status of Dr. Evans must have been of the highest, otherwise such confidence would not have been reposed in him. And no doubt there will be some who will point to this or that dentist in a European capital, who must have had, besides an extensive clientele, a foothold in society, otherwise there could not have been the elopement with the titled lady which recent history has chronicled not once but quite a number of times. But armed even with these data the friendly critic would be hard put to show that the social position of the dentist is what it should be, or convince an obdurate medical profession or that part of the laity that makes the social laws, unjust though they be, that a dentist may at times approach the mental and physical graces of other professional men.

In a novel which we have recently read—"The Joy of Youth" by Eden Phillpotts, Hastings Forbes describes the elopement of his wife in the following trenchant words: "She leaves a letter for me. . . . The cynicism—the bitter cynicism! A bolt from the blue. In a word—a dentist! A wretched dentist from Exeter. I believe his beastly name is Wicks. . . . He's an American dentist. . . . She has gone to Italy with him. . . . Fancy having secrets with a dentist! I feel as if I ought to shoot him, Vane. But, then, who could shoot a dentist?" Here we have the whole social status of the dentist of to-day summed up, for though the speaker is an Englishman we have no doubt the same flow of language would emanate from an outraged and irate American whose wife had demeaned him in the eyes of the world by eloping with a dentist. Now it is a fact that physicians and even surgeons have eloped with other men's wives in novels and also outside novels, but has anyone ever seen the statement in print or heard it in the streets or in his club that the offender was too low to be shot? Unfortunately, when this social upheaval occurs, the doctor is invariably wounded or killed, which occurrence, though untoward, nevertheless carries with it the distinction that he is worthy of being noticed by the grief-stricken husband. And the inference must be, if we are to believe what Mr. Phillpotts puts into the mouth of one of his characters, that the dentist will never be the social equal of other men until under similar circumstances he becomes the mark for a well-aimed pistol. Does the dentist wish to reach the social heights by being singled out in this manner or would he rather remain in his present social obscurity? This is a question which only he can decide.

P. S.

THE TYRRANY OF PREJUDICE.

For reasons which have never been satisfactorily explained, either by those so-called medical scientists who have exploited their opinions in medical journals of the second rank or the workers in the matter of social reform whose blatancy is too readily accepted by the public at large as a remarkable insight into the problems of the day, the cigarette has been made the scapegoat for all those physical and mental upsets which, while not of a serious nature, are nevertheless disturbing enough to convert an erstwhile contented citizen of rosy cheeks and athletic build into a wan-faced entity whose lackadaisical disposition and general behavior indicate that his interest in life is decidedly below normal. That the cigarette when used in excess, especially by him who starts the battle of life with a brain that easily wobbles under strong emotions or that cannot withstand the ordeal of deep thought or uninterrupted application covering some weeks, may be responsible for the ills which have made the subject of nervousness the most complicated if not the longest chapter in medicine, cannot be denied; but when admitting this one should not overlook the important fact that in the majority of cases it is the excess which causes the harm and not the cigarette itself, though we must admit that in our peregrinations we have met quite a large number of individuals who no doubt would be completely undone by the smoking of a solitary one, and this without any special idiosyncrasy, so great indeed is the effect of the horror of the act on minds which are none too careful in allowing stomachs to be the receptacles of all sorts of indigestible foods and drinks.

Quite recently the most celebrated inventor in this country and the most successful manufacturer of the cheaper grade of motor cars have ventilated their opinions on the subject of the cigarette, and already the medical journals and especially the daily press are ringing with the ancient prejudices, stating them as if they were the last cry in scientific investigation, when in fact they are our very old and tiresome friends not even respecting us enough to have the dust brushed from their faces. Of course, thousands will read what is at present being written and will form their own little opinions; and doctors will be consulted and they will have to express their weighty opinions to interested fathers and mothers, and the fathers will tell their friends what their doctors told them in strictest confidence, and then imagine themselves quite the heroes of the day when they smoke their ill-smelling pipes or the cheaper brand of cigar.

Amid the chorus of the strident voices which have latterly thundered so brassily the harmful qualities of the cigarette, the writer sought in vain for one statement which would show that

even the cigarette, unpopular though it be, and the undisputed cause of epilepsy, softening of the brain, alcoholism, hysteria, neurasthenia, insomnia, husbands beating wives, loss of manhood, tuberculosis of the larynx and a few other mild disturbances, had at least what to be charitable might be called one solitary negative virtue. But though discouraged on account of this failure, such is his belief in the adage that everything is for the best in this best of worlds that his hopes were not completely squelched; and that he was rewarded for his patience and forbearance and his unswerving belief in optimism should not be too lightly thought of by the reader, for if the latter will turn to the pages of the *Medical Record* of May 30th and read Dr. George W. Vandegrift's article on "Tobacco Amblyopia" he will understand at once why the writer is still hopeful that one of these days the reputation of the cigarette will not be that of an outcast. To quote: The disease [tobacco amblyopia] is usually found in men about or after the age of thirty-five, and more frequently in pipe and cigar smokers and chewers than in cigarette smokers. The latter class more easily escapes probably first because there is no absorption through the mucous membrane of the lips, the paper wrapper serving as protection, and second, because of the rapid and complete combustion of the tobacco."

Now if what Dr. Vandegrift says is true, might we not hope that before long other investigators will come to the front, not to champion the cigarette so that it will be universally used, but to show that the pipe and cigar are not without faults, and that when the evils of smoking are mentioned the triumvirate—the pipe, the cigar and the cigarette—should come in for an equal amount of criticism, for either of the three, if used in excess, may play havoc with organisms, just as does the excessive use of alcohol with "mortal men with mortal kidneys."

P. S.

LITERARY NOTE.

If, as has so often been said, the supreme test of a book is its interest, then there is no better book to read at present than "Man's Miracle" by Gérard Harry (William Heinemann, London), for on every page, one might say, there are sentences of so great a value in explanation of the education of Helen Keller, Laura Bridgman and the two French girls, Marie and Marthe Heurtin that the reader cannot but be astounded by the progress made by these blind deaf mutes. Helen Keller's advances along educational lines are exceptionally interesting, and whether the credit should go entirely to her teacher, Miss Sullivan (Mrs. Macy), or be attributed to her genius, will always be a matter of controversy, so great have the influences of both been in shaping her remarkable mental develop-

ment. The progress of this deaf mute, from the time when she was in a state of complete ignorance until the present, reads like a fairy tale, and no wonder the author, who has all the sympathy and keen insight characteristic of the intellectual Frenchman, as well as an appreciation of the *mot juste*, calls his book "Man's Miracle." Can the whole history of education show another instance of such educational leaps and bounds as are illustrated in Helen Keller's case from the time her teacher patiently wrote day after day the word water on the palm of her hand and had to wait months until there was a response—a ray of intelligence—until now when she stands before the public as the greatest educational product of the age, for despite the lack of three of her senses she knows Greek, Latin, French and German and has read more than the average person: Kant, Schopenhauer, Nietzsche, Spencer, Gustave Le Bon, Tolstoi and others, and, what is more wonderful than all this, has regained in some measure her speaking voice? Of course, it were idle to say that all persons similarly afflicted could achieve these heights even were they so fortunate as to have a teacher of Miss Sullivan's infinite patience; but, even so, the great lesson to be gleaned from Helen Keller's career must have weight with all teachers of deaf mutes from now on, and especially must it be apparent to these same teachers that when the further affliction of blindness is added, all hope should not be abandoned. Illustrative of the latter contention is the case of Marie Heurtin and her little sister, Marthe, at Larnay, France, who, though not brilliant examples in the class with Helen Keller, have nevertheless made good progress, and are evidence beyond a doubt that for all deaf mutes, who are also blind, there is hope, since these French children "have inherited the taint of conjugal consanguinity, and their parents, though honest, were very poor and almost illiterate" . . . and have been "condemned by circumstances to a limited horizon, and to spend [their] lives in the quiet of a religious asylum." A precious book this, and one to be read alike by doctors and educators.

P. S.

ORIGINAL ARTICLES.

HYPERACUTE CEREBROSPINAL MENINGITIS.

By H. HAROLD SCOTT, M. D. (Lond.), of Kingston, Jamaica,
Bacteriologist to the Government of Jamaica; Pathologist to the Kingston
General Hospital, etc.

I have received the honor of an invitation from the Editor of the JOURNAL to contribute a short paper on the subject of fulminating cerebrospinal meningitis. This subject is one of great interest and considerable importance, and I have had the opportunity of seeing several cases during the past twelve months while carrying out investigations with a view to elucidating a disease of unknown causation at present, described locally by the non-committal name of the 'Vomiting Sickness of Jamaica.' Both the course and the clinical symptoms of the latter, in many instances, very closely simulate those of the condition under consideration, but the similarity does not extend beyond this.

The actual pathological findings are quite different, and, so far as one dare be dogmatic upon a disease whose *causa causans* is yet to seek, there is, in my opinion, no etiological connection between the two affections. I shall not dwell on the so-called vomiting sickness in this paper, partly because I do not regard the two diseases as at all identical (although, as stated, in some cases the symptoms are alike), but for a more potent reason—namely, that Dr. Harald Seidelin, who came out to Jamaica last January to study the vomiting sickness, has not yet published his report, and it would not be fair to him to make my ideas public until he has given his to the world.

The ordinary case of cerebrospinal meningitis is familiar probably to most medical practitioners; no time need, therefore, be taken up by describing it, but I shall confine my remarks to the peculiarly hyperacute type such as it has been my lot to see, which may be fitly named fulminating or malignant, for it is in very truth a terrible disease.

BRIEF DESCRIPTION OF THE SYMPTOMS AND COURSE OF THE AFFECTION.

In the *Annals of Tropical Medicine*, Volume VII, No. 1, I have already given a résumé of the general symptoms, and what follows is partly quoted from that journal.

The patient, usually a child, goes to bed apparently in its normal state of health. During the night he becomes restless and wakes up, complains of feeling ill and vomits. The vomiting may be repeated once or twice at short intervals, usually without effort, and in an hour or so the child seems to recover and drops off to sleep again. During the ensuing three or four hours, or a little more, the patient may be restless and toss about in bed, but quite as commonly sleeps peacefully, and then suddenly sits up and vomits again. The vomit consists at first of food or frothy mucus according to the length of time which has elapsed since the previous meal; later, of watery fluid, sometimes bile-stained. So long as the stomach contains food, solid or liquid, the vomiting is apparently effortless, but if empty there is troublesome retching. More alarming symptoms now supervene, and in a very short time, it may be only a few minutes, convulsions ensue, during which the limbs are rigid and the head is drawn back; and a state of coma rapidly succeeds and terminates in death.

Before passing on to the objective signs, two points in this brief sketch deserve a little more elaboration. First, questioning the parents may reveal the fact that certain slight prodromal symptoms have been present, but were so mild as to have almost escaped observation. Thus, for the preceding twenty-four hours or longer, the child may have shown some loss of appetite, have been disinclined for play, have exhibited a tendency to lie down, and have suffered from a cold in the head. This last is, I think, important, as the symptoms may very likely have been the 'premeningeal catarrh' set up by the localization of the organism in the posterior nares. Secondly, detailed enquiry rarely reveals any particular dietetic error to which the earlier attack of vomiting can be attributed, so rarely in fact as to be merely a coincidence, and the effortless character of it makes one think that it is purely of central origin.

The calm period succeeding the initial onset gives a false sense of security to the parents, who naturally imagine that the child has eaten something which has disagreed, and that, with the cessation of the vomiting and the falling off to sleep again, all danger is past. A medical man is, therefore, not sent for until with the recurrence of the symptoms the alarm is renewed. The little patient is, then, not seen by the doctor until in the convulsive or comatose stage, and often, indeed, the child is dead before professional as-

sistance can be obtained. The total duration of the illness in these hyperacute cases is very short. Inclusive of the period of calm, the average time elapsing between the first onset and the fatal termination may be only twelve hours, or even less.

Objective Signs.—The temperature is rarely above 102° F. and is often normal when the patient is first seen. The pulse-rate is between 90 and 100, of fair strength, unless the vomiting is severe; respiration 26-30, usually regular, though towards the end the Cheyne-Stokes rhythm may make its appearance. The convulsions are not as a rule localized; Kernig's sign is present in some of the cases only, by no means in all, and it is not uncommon to find that it is distinctly more marked in one leg than in the other. In the worst cases retraction of the head is not a prominent symptom, but in nearly all there is rigidity of the muscles at the back of the neck, even in the intervals of the convulsions. This may easily be overlooked if the flexion of the head on the trunk is attempted while the child is lying on its side, for it is very difficult then not to combine the movement of flexion with a lateral one. Lateral movement may be comparatively free, although rigidity of the neck muscles is present, and the stiffness is thus masked; and even if the patient is not unconscious, lateral movement may cause no pain, and if the rigidity is of a slight degree only, the loss of mobility is not complained of and is only found out by careful testing. In order to do this, it is important for the child to be on its back; the hand is then gently inserted beneath the occiput and flexion attempted strictly in the middle line. Rigidity, if present even in a very slight degree, can be felt with a little practice, and it is evidenced by the expression of pain on the part of the patient.

The pupils are usually equal, moderately dilated, and react normally if the coma be not too deep. If consciousness is retained there is irritability and a state of general flexion, and if the child is old enough to understand questions or to express itself voluntarily, there is complaint of headache, more often frontal, but in some cases generalized, but by no means always severe. Delirium in these acute cases is very unusual, judging from those which I have seen.

In cases not terminating fatally the state of coma is rarely arrived at. Vomiting, convulsions, and headache are present, but during the intervals between the convulsive attacks consciousness is retained, and recovery may be very rapid.

The character of the cerebrospinal fluid is, as would be expected in these hyperacute cases, different from that of the average acute or subacute ones. The fluid is clear or very faintly opalescent; by transmitted light a sort of iridescent effect is sometimes noticed if the fluid is withdrawn towards the termination of the attack, say after the twelfth hour. This is due to very minute suspended particles. A faint albumin reaction is given. Microscopically, the

number of leucocytes is small at this early stage; in fact, the search for them is a laborious undertaking unless the fluid is previously centrifugalized. Compared with smears made after three or four days of an ordinary attack, the organisms are relatively numerous. Also at this early stage the leucocytes present may be almost entirely of the mononuclear variety, and the organisms consequently not intracellular. If, however, the fluid is turbid, the proportion of polymorphonuclear cells is raised and in them the diplococci are seen.

In those cases which give a history of malaise and a tendency to lie down for a day or two preceding the onset of fulminating symptoms, there is more likelihood of the fluid showing the haziness mentioned above, and the relative number of polymorphonuclear cells is higher. Here, in spite of the history given of only a few hours' illness, the disease may have been of longer standing than the parents of the child imagine, and we are probably dealing with a violent termination to a disease which has lasted for three or four days, and not with the true fulminating type where the child is apparently well one hour and dead twelve hours or so after.

Occasionally I have seen a slight herpetic eruption about the mouth, but the 'spotted fever' rash of epidemic cerebrospinal meningitis is not seen. This would be very difficult to recognize on the negro skin, even if present, but I do not think it does appear, the patient dying before it has time to develop.

THE ORGANISM.

Detailed description is not called for, though one or two peculiarities must receive mention. Briefly, the organism morphologically agrees with the usual book descriptions of the meningococcus, *i. e.*, it is a Gram (Claudius) negative diplococcus, often intracellular, occurring in the cerebrospinal fluid, growing with difficulty (and as a rule only after training) on ordinary media, much more readily on Nasgar at 37° C., not at all at 22° C. By Gram's method of staining, decolorization is in some instances less complete, or at all events takes longer to carry out than in others, and also the results of growth in sugar-containing media vary. In dextrose and maltose, acid is produced, but in galactose this does not always take place, while at other times the acid reaction is later in making its appearance.

These small differences do not warrant any real distinction being made between it and the meningococcus of Weichselbaum; Jaeger's strain has been found to give similarly variable results by Gram, and if the Claudius modification be employed the organism proves to be negative.

No useful purpose would be served by describing here the methods of preparation of the media employed, but a brief statement may be

given of the mode of procedure. The spinal fluid was inoculated on to Nasgar and incubated at 37° C.; if the fluid was plentiful, ordinary agar tubes were also inoculated; smears were made of the fluid before and after centrifugalization, and stained either by Leishman or Giemsa (rapid method) for enumeration of leucocytes and presence of organisms, and in some cases smears were stained by Gram and counterstained by safranin.

Suspicious colonies on the inoculated tubes or plates were subcultured on to Nasgar and agar and incubated at 37° C. and at 22° C. Growth in most instances was only obtained on the former medium and at the higher temperature. From this further inoculations into various sugar-containing media were made; saccharose, lactose, maltose, mannite, dextrose, and galactose being always employed.

BRIEF NOTES OF A FEW CASES.

I have already mentioned in the *Annals of Tropical Medicine* the devastation wrought in one family, where out of seven children four died between 7 a. m. and 6 p. m. the same day; another was attacked on the following day but ran an ordinary course and recovered, while a sixth was harboring the organism in his posterior nares but showed no symptoms. I also gave a description of a case in which there was a condition of meningococemia. Others may now be mentioned.

CASE I.—C. R. and M. R., sisters, *æt.* five and seven respectively. The former suffered from general malaise, had a cold in the head and 'running at the nose,' and instead of playing about as was her habit seemed to want to lie down and rest during three days preceding a sudden onset of vomiting at 4 p. m., January 11th, 1913. This was repeated three times between 4 and 5 p. m. and the child was restless and irritable. She then was seized with convulsions, and in the intervals the neck muscles were noticed to be stiff and there was some rigidity of the limbs; Kernig's sign was present. Death took place at midnight, so that the total duration may have been about three and a half days, but death occurred eight hours after the onset of the first striking symptom. The cerebrospinal fluid in this case was slightly turbid, and 78 per cent. of the cells were polymorphonuclears. Gram-negative diplococci were seen, both intra- and extra-cellular. A growth was obtained which was typical except for having no action on galactose. The cold in the head was very likely a premeningeal catarrh. The sister, M. R., was to all appearances quite well until 5 p. m. the same day, when she vomited. She soon recovered, and at 6 p. m., ate a meal which seems not to have consisted of anything unusual, and she went to bed apparently in her ordinary health at 9 p. m. Five hours later (2 a. m.) the vomiting returned, convulsions came on with general rigidity and retraction of the head, coma supervened, and death took place at 7 a. m., *i. e.*, fourteen hours after the first onset and five hours after the return of the symptoms. The spinal fluid was in excess, flowed freely, and was clear. Gram-negative diplococci were seen in smears made after centrifugalization, but they did not develop on culture media. (Note the short duration and the fluid clear.)

CASE II.—A. H., male, *æt.* four; a strong-looking, well-nourished child,

apparently quite well until 11 p. m., January 17th, when he had an attack of vomiting rapidly succeeded by convulsions. In the intervals of these the muscles of the neck were distinctly rigid, though there was no actual retraction. Kernig's sign was very marked on both sides. Spinal fluid was clear and flowed under considerable pressure. Death occurred at 8:30 next morning, *i. e.*, nine and a half hours after the initial attack of vomiting. Pearly, sticky lymph was slightly present over the vertex, more marked at the base, and the hemispheres were, so to speak, 'battered together' by a thin layer of it. A very good growth of the meningococcus was obtained which gave an acid reaction in galactose also.

CASE III.—E. G., *æt.* ten, and M. G., *æt.* seven, sisters. Histories very similar to what has already been stated—going to bed well to all appearances, then the onset of restlessness, vomiting, convulsions, coma, terminating in death—the former died in nine hours, and the latter in six hours after the onset of the vomiting. The spinal fluid was clear and flowed freely in both cases, and the organism (which, however, caused no change in galactose) was obtained in pure culture from the former. Gram-negative diplococci were seen in smears made with the fluid from the younger, but they did not grow on subculture.

CASE IV.—H. E., *æt.* nine years, M. E., *æt.* eleven months, also sisters. H. E. is an example of the period of intermission between an acute onset with apparent recovery and the return of more violent symptoms terminating fatally. Vomiting occurred several times during the night of March 5th and twice early on the morning of the 6th. She was up and about, however, and did not seem ill during that day. Late the same evening she complained of headache and became very restless; at 10 p. m. she lapsed into unconsciousness (there were no convulsions) and died at 3 a. m. The total duration was, therefore, about thirty hours, but the final stage only lasted some 8-10 hours. The sister, aged eleven months, was seized four hours after the death of the last named, had four attacks of convulsions, and died in three hours. A Gram-negative diplococcus was cultivated from the spinal fluid in both cases, but strange to say that from the older patient had no action on galactose, whereas that from the younger gave rise to acid in this as well as in dextrose and maltose.

CASE V.—C. C., male, *æt.* six; L. C., female, *æt.* three; brother and sister. C. C. quite well until 6 p. m., March 6th, when he had an attack of retching which continued intermittently for two hours. He then improved greatly, ate a good meal, and later went to bed feeling much better. He slept well during the night. In the early morning the retching returned and he became comatose and died twelve hours after the initial onset.

Post-mortem there was exudation of lymph in the sulci of the brain and the spinal fluid showed very faint turbidity. Smears contained Gram-negative diplococci, some intracellular, but no growth occurred on attempting to culture.

L. C. suffered from a cold in the head for a few days before the attack came on, but did not appear to be ill otherwise at the time of going to bed on the 6th. At 3 a. m. the mother awoke to find the child vomiting and convulsed. At 6:30 she took it up to carry it to a doctor, but it died in her arms on the way. Total duration, six and a half hours. Post-mortem, the findings were the same as in the brother's case, but typical meningococcus developed from the spinal fluid of this patient.

CASE VI.—L. R., female, *æt.* forty. This again is an instance of an interval of partial recovery succeeded by a rapidly fatal secondary return of symptoms. The history is not very definite, as the patient lived a lonely life, but so far as it could be obtained it was to the effect that she had complained of headache on March 3rd and of general malaise. On the 5th

vomiting came on and was more or less troublesome for the next four days. It is not certain whether she had convulsive attacks. At 3 p. m. on the 9th she lapsed into unconsciousness and died at 10:30 a. m. (10th). No albumin, no sugar, no casts in the urine. Spinal fluid taken by lumbar puncture was uniformly turbid, contained 76 per cent. polymorphonuclear leucocytes with some intracellular diplococci. There was a good growth of these organisms which gave typical sugar reactions.

CASE VII.—W. P., male, *æt.* five and a half, complained of severe headache, had attacks of vomiting (frothy mucus only), and was very irritable on December 28th, 1912. There was some degree of rigidity of the neck, and Kernig's sign was marked; temperature 102.8° F.

Lumbar puncture was performed; the fluid flowed freely and under pressure was faintly opalescent, and from it a pure growth of meningococcus was obtained. Of the leucocytes present, 67 per cent. were mononuclear.

The child appeared brighter when seen again six hours later, and the following day was found sitting up in bed, and in another forty-eight hours was up, the only residual symptoms being debility and some headache, not apparently very severe.

INFLUENCE OF AGE AND SEX ON INCIDENCE AND DURATION.

The tables appended to this paper are almost self-explanatory; a very few words will suffice in amplification. Table I gives the number of cases of both sexes at the various ages, from the spinal fluid of whom a Gram-negative diplococcus was isolated. In several instances the organism was seen in smears of the spinal fluid, but did not grow either on subculture or did not survive long enough for subsidiary tests to be carried out. Such are given in Table II. Table III is merely a combination of Tables I and II.

From the point of view of age it will be seen that the condition is very largely one of childhood. Sex has little if any influence, though it will be noticed that all those occurring under the age of one year were females; after this age at one time males, at another females show a slight preponderance. The numbers, however, are too few to warrant any definite statement. They are mentioned because the figures given may form a foundation to which further additions may be made from time to time as other cases occur. It will be seen that amongst males 63.6 per cent. of cases, while amongst females 63.3 per cent., were under the age of six years. With the inclusion of 'probable' cases (Table III) 63.6 per cent. of cases occurred in boys below the age of six years, and 68.2 per cent. in girls.

The mortality is very high; of the whole 52 recorded only 11 recovered, the death-rate being, therefore, nearly 80 per cent. (78.84 per cent.).

Table IV shows the duration of illness at the different ages. It will be seen from this that age has practically no influence in this respect, nor has sex; for, strange to say, the average duration of all

the cases works out exactly the same in males as in females—namely, fourteen and a half hours.

Finally, with regard to *treatment* I intend to say very little on this subject because, if ever the circumstances were such as to permit of the fallacy of translating *post hoc* into *propter hoc*, they are indeed present here. In the paper already referred to, I mentioned some of the points militating against the use of antimeningococcic serum in a tropical country. As regards vaccines, I also stated there that I had prepared autogenous ones from some early cases and that after its employment certain patients had improved, and others showing what might have been the signs of oncoming disease—vomiting, headache, irritability—got well without the graver symptoms appearing, while again in a district where 6 or 8 fresh cases were appearing daily, the vaccine was employed for contacts without any of them developing the disease; nevertheless, I do not feel justified in claiming that the specific treatment was responsible for these fortunate results. This would be exceedingly difficult to prove in a disease which may spontaneously terminate favorably in a short time (Case VII). Moreover, theoretically, one would hardly expect vaccine therapy to have much if any beneficial effect in so excessively acute an infection. Its use would come in as a prophylactic in regions where the condition occurs year after year, and even then we must remember that epidemics of cerebrospinal meningitis vary greatly in intensity, and fallacies would easily enter into interpretation of the effects of, or rather results after, vaccine treatment.

TABLE I.

Age	Below 1 yr.	1-2 years	2-3 years	3-4 years	4-5 years	5-6 years	6-7 years	7-8 years	8-9 years	9-10 years	10-11 years	11-12 years	12-13 years	13-14 years	14-15 years	15-16 years	16-17 years	17-18 years	18-19 years	19-20 years	Over 20 yrs.	Total
Males.	—	3	1	3	3	4	2	3	—	—	—	2	—	1	—	—	—	—	—	—	—	—
Females.	5	3	3	5	2	1	—	2	2	1	1	—	1	—	—	1	—	—	1	—	—	—
Total.	5	6	4	8	5	5	2	5	2	1	1	2	1	1	—	1	—	—	1	—	2	52

Cases in which the diplococcus was isolated from the cerebrospinal fluid.

TABLE II.

Age	Below 1 yr.	1-2 years	2-3 years	3-4 years	4-5 years	5-6 years	6-7 years	7-8 years	8-9 years	9-10 years	10-11 years	11-12 years	12-13 years	13-14 years	14-15 years	15-16 years	16-17 years	17-18 years	18-19 years	19-20 years	Over 20 yrs.	Total
Males.	—	2	2	1	1	1	1	—	1	1	—	—	1	—	—	—	—	—	—	—	—	11
Females.	1	—	2	4	—	2	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	11
Total.	1	2	4	5	1	3	3	—	1	1	—	—	1	—	—	—	—	—	—	—	—	22

Cases in which the diplococcus was seen in smears or primary culture, but in which subcultures were not successful.

TABLE III.

Age	Below 1 yr.	1-2 years	2-3 years	3-4 years	4-5 years	5-6 years	6-7 years	7-8 years	8-9 years	9-10 years	10-11 years	11-12 years	12-13 years	13-14 years	14-15 years	15-16 years	16-17 years	17-18 years	18-19 years	19-20 years	Over 20 yrs.	Total
Males.	—	5	3	4	4	5	3	3	1	1	—	2	1	1	—	—	—	—	—	—	—	33
Females.	6	3	5	9	2	3	2	2	2	1	1	—	1	—	—	1	—	—	1	—	2	41
Total.	6	8	8	13	6	8	5	5	3	2	1	2	2	1	—	1	—	—	1	—	2	74

Cases in which the diplococcus was seen (compiled from Tables I and II).

TABLE IV.

Age	Below 1 yr.	1-2 years	2-3 years	3-4 years	4-5 years	5-6 years	6-7 years	7-8 years	8-9 years	9-10 years	10-11 years	11-12 years	12-13 years	13-14 years	14-15 years	15-16 years	16-17 years	17-18 years	18-19 years	19-20 years	Over 20 yrs.	Average at all ages, in hours
Males.	—	21	2	11	9	32	18	13	—	—	—	9*	11	—	—	—	—	—	—	—	—	14½
Females.	14	19½	4	11½	13½	18½	—	15	19	9	—	9*	24	—	—	12	—	—	9*	—	9*	14½
Average.	14	20¼	3	11¼	11¼	25¼	18	14	19	9	—	—	17½	—	—	12	—	—	—	—	—	14½

Showing average duration at various ages and average for all ages.
 * In these the history was incomplete or unreliable.

BENZOL IN LEUKEMIA.

By LOUIS A. LEVISON, M. D., of Toledo, Ohio.

It is now about two years since von Koranyi and his pupil Kiralyfi used benzol in 6 cases of leukemia and came to the conclusion that these cases were favorably influenced thereby. Selling, whose experiments were the basis of von Koranyi's work,¹ injected benzol subcutaneously into rabbits and secured an enormous drop in the white cells. This was due to an almost total, but temporary atrophy of the blood-forming organs, especially the bone-marrow. Selling observed that protracted use of benzol affected the red blood-cells deleteriously. The spleen and lymphatic apparatus showed marked aplasia after continued use of benzol.

An observation by Barker was found to have a bearing on this subject. Barker watched three girls working in benzol factories. They developed purpura hemorrhagica and an aplastic type of anemia from which 2 out of the 3 died.

Von Koranyi noted the following facts in his early use of benzol. At first there is a transient increase in the white blood-cells followed in one, two, or three weeks by a slow, then a rapid decrease in their number; in some of the cases, the white cells dropped from one and two hundred thousand to normal in a few weeks; the spleen became softer and decreased in size, sometimes quite rapidly; the lymphatic glands became smaller or disappeared entirely; the toxic symptoms—fever, sweats, and mental involvement became better; the weight increased; the general condition, spirits, and appetite improved; the hemoglobin content and the red blood-cells increased.

Following this report of von Koranyi, numerous other reports appeared in the literature until there are now approximately 100 case reports in which this method has been tried. These reports show variable results, but all agree that benzol is an agent capable of doing much good or great harm. Several reports have issued from von Koranyi's clinic since the first communication. In some of the cases which gave excellent results, the x-ray and thorium X had been used without avail. Von Koranyi tried benzol in both types of leukemia—the lymphatic and the myelogenous. It could not be determined that there was an essential difference in the action of benzol in these two primary forms. Some of von Koranyi's cases exceeded 300,000 white cells, but even in cases with these high counts benzol reduced the white cells to figures approximating normal.

Dosage.—Von Koranyi used and advised benzol to be given in doses of 3 to 4 gm. daily for months. He used even larger doses (5 gm.) for short periods. We possess in benzol a powerful weapon to combat leukemia. It is, however, a powerful poison demanding great care in its administration. Large doses can produce serious or even fatal damage to the tissues of the body, more particularly to the liver, kidneys, and the hematopoietic system. Untoward results may appear also on the part of the lungs and gastro-intestinal tract. According to Pappenheim, the doses of benzol given humans without harm are too small. Pappenheim believes that if we limit the dose to an amount which will not harm the individual, it will be too small to produce retrogressive changes in the bone-marrow. These small doses will only be sufficient to cause irritation; larger doses will damage the liver and kidneys. Pappenheim in his experimental work gave rabbits, weighing 1,200 to 1,500 gm., 2 to 3 gm. daily. This dose was tolerated, but when the doses were increased to 4 gm. the animals became paralyzed and died. Even doses of 3 gm., if continued with pauses of one to two days, eventually caused death with great emaciation. Selling, who experimented with great numbers of animals concerning the action of benzol on the blood and blood-forming apparatus, found that benzol in big doses caused absence of the white cells and destruction of bone-marrow. Selling showed also that small doses stimulated the blood-producing organs, while big doses had the reverse effect. Selling considered doses of 1 gm. for each kgrm. body weight as a large and harmful amount. From this work Pappenheim believes that the usual dose in humans of 3 to 4 gm. daily is too small to inhibit or destroy the white cell apparatus, and can only stimulate or irritate it. Pappenheim's belief appears to be contrary to Selling's work.

Pappenheim also studied the effects of benzine. It seems to be somewhat better tolerated than benzol. Animals take 6 to 8 gm. daily with about the same results as from smaller doses of benzol. The kidneys and liver are irritated, but to a lesser degree than from benzol. The bone-marrow changes are also less.

Benzol in large and sometimes even in small doses produces various symptoms. Burning in the stomach region, or along the course of the esophagus are common manifestations. Belching, flatulence, pain, vomiting and nausea may occur. Dizziness, evidences of a tracheo-bronchitis, or albuminuria may occur. The treatment may have to be discontinued on account of the stomach disturbances. The urine must be carefully watched. Red blood-cells or washed-out red blood-cell rings may appear in the urine. Nucleo-albumin is also occasionally met with. The benzol is excreted in the urine and may be tested for in that fluid. The question of mucous membrane hemorrhages will be considered below. Regardless of the

leukemic condition present, there is a marked difference in tolerance of various patients to benzol. There can be no fixed dose, but the average daily amount should be from 3 to 5 grm.

Method of Administration.—The experience of the last two years has given rise to certain precautions which must be carried out in using this remedy. It may be said at the outset that benzol is never to be given a patient who cannot be kept under the most careful observation. Blood-counts should be made at short intervals, in order to stop or vary the dose to meet sudden indications. The usual and most common method of administration is to mix equal parts of benzol and olive oil, and from this mixture have the patient himself fill capsules and take as many as directed. The capsules should be taken after meals so that the liberated benzol does not irritate the mucous membrane of the stomach. If it is necessary to take the capsules at some other time than after meals, the patient should be instructed to drink a glass of milk immediately afterward. The administration of benzol on an empty stomach will almost invariably produce symptoms of gastro-intestinal intolerance. Benzol has also been given in mucilaginous mixtures with acacia and tragacanth. The patient should be instructed to keep the bottle well stoppered.

It may not be possible to make benzol acceptable to the stomach with any mixture. In such a case, Kiralyfi² tried benzol per rectum. Two gram doses in 50 grm. olive oil were given three times daily. Under this method, the white cells fell from 73,000 to 8,000 in sixteen days. Klein has injected benzol subcutaneously alone or with olive oil. Doses of 2 grm. cause much smarting and burning at the site of injection, but the ultimate effect is the same as by mouth. Bronchitis offers a contraindication to benzol as it aggravates the cough. The same holds true for tuberculosis, which is a rather frequent complication of leukemia and other types of lymphadenitis.

Effect of Benzol on the White Blood-Cells.—It was early noted that benzol first increased the white cells before the drop in number began. This is a quite constant occurrence, although some few exceptions have been reported. The same phenomenon obtains with normal individuals. The initial increase is noted in the first week or ten days under moderate dosage, but, if large or excessive amounts are given from the start, this stimulation effect may be absent or fleeting. All types of leukemia react as one in this regard. It is not possible to say in advance how a given case will react to benzol. Benzol in this respect does not differ from any other therapeutic agent. Tuerck speaks of a case in which he was obliged to give 292 capsules over a period of seven weeks before the white cells fell to 7,000. The purpose of benzol therapy is not to attain the lowest possible count in the shortest possible time, but to attain a slow and

gradual fall without incapacitating the patient. The treatment should not be too energetic or too long-continued, as this may lead to acute and alarming exacerbations. Attention should also be called to the fact that spontaneous remissions or intermissions may occur in leukemia which may mislead one into thinking that it is a result of benzol. Such spontaneous remissions may last two or three years before a recurrence occurs.

Some of the reported cases have shown white blood-counts as high as 1,000,000 (Klein³). Cases with such high counts cannot be expected to react as favorably as cases with counts of from 150,000 to 200,000 and downward. Most of Kiralyfi's cases had comparatively low counts, and this may have been a factor in his favorable results. Kiralyfi states that one must persevere as long as three months sometimes before securing results. Klein has, however, given benzol for four months, and then used it subcutaneously without lowering the white cells to any considerable degree. Klein thinks it may be possible that there are areas in the bone-marrow inaccessible to the benzol, and that these areas may continue to send forth blood cells into the blood-stream, and that this may explain stubborn, non-reacting cases. There are likewise cases with low counts which are not influenced by benzol, but this is comparatively infrequent.

A very important point to be remembered in administering benzol is its action after the drug has been stopped. Earlier workers with this agent kept up the benzol in favorably reacting cases until the white cells approximated normal. This has been shown to be a mistake and in some cases a fatal one. The white cells will keep dropping for an indefinite time after the benzol has been stopped. It is perhaps best to intermit the treatment for a period when the count has reached twenty or twenty-five thousand. If within a reasonable time the white cells do not drop to normal, the benzol can be started again. This after-action of the benzol can be very intense, as shown in a case observed by Neumann in Voit's clinic. In this case of leukemia, the white cells fell from 56,000 to 5,000 in a short time. The benzol was stopped at this point, but the whites continued to fall to 200. In the meantime, the patient developed an almost uncontrollable nosebleed. Death occurred thirty-nine days after the discontinuance of the benzol. Stern⁴ has seen a similar case in an eighteen-year-old girl whose illness had begun two years before. The white cells numbered 73,000 on admission; myelocytes 20 per cent. Benzol was given by mouth and rectum, and in sixteen days the white count had fallen to 8,000. The case was considered a very favorable one and the benzol discontinued, but the white cells dropped further to 2,800, when the patient developed a severe nosebleed which resisted gelatine, serum therapy, and tamponades. The bleeding continued seven days in a desperate manner,

while the white cells fell to 1,000. Death occurred twenty-two days after stopping the benzol, and on the day of death the white cells numbered only 460. Hemorrhages occur spontaneously in leukemia, but there is no question that benzol predisposes to this dangerous complication.

The qualitative blood-picture does not react as favorably as the count. Only in rare cases was it possible to get the blood-picture back to normal or nearly so. Klein has never seen a normal picture attained in myelogenous leukemia. Myelocytes and even myeloblasts could always be found on careful search. The mast-cells and the eosinophils were found usually to be absolutely increased. The lymphatic cases are more apt to approximate normal. Klein has seen normal lymphocyte percentages. In one of his cases, there was produced a leukopenia with a relative lymphocytosis—a pathological finding. The qualitative change after benzol in myelogenous cases consists in an increase of the polymorphonuclears at the expense of the myelocytes. The combined percentages of these types remain about as before.

The effect of benzol on the red blood-cells and hemoglobin is a distinct one. The red cells increase as a result of the stimulant action of the benzol on the bone-marrow. Pappenheim⁵ showed in his experiments on rabbits that the bone-marrow is constantly affected by benzol. Moderate doses cause a hyperplasia, and larger doses produce dilatation and filling of the blood-vessels and atrophy of the parenchyma of the bone-marrow. If the period of benzol therapy is a prolonged one, the effect on the red cells and hemoglobin is a harmful one. The stimulant action of the benzol may bring the number of reds to normal, but the hemoglobin often remains low. In some of the cases in which death has followed hemorrhages, presumably the result of too long use or too heavy dosage of benzol, nucleated red cells completely disappeared from the blood where they had been before—a sign evidently that the regenerating power of the bone-marrow was entirely absent. Klemperer and Hirschfeld employed small doses of benzol with good results in cases of pernicious anemia. Koranyi tried benzol in one case of polycythemia with an enlarged spleen and a normal white count. At the end of the first week the red cells had increased from 9,000,000 to 10,000,000 from the stimulant action, but after three weeks the red cells had decreased to 6,700,000. Along with this drop in the red cells, there was an improvement in the general condition.

Action of Benzol on Various Organs and Tissues.—The spleen has become smaller in practically all the cases treated. The lymphatic glands in cases of lymphatic leukemia quickly decrease in size. It is agreed that large doses will harm the liver and kidneys. Blood may appear in the urine, either as a hematuria or washed-out red blood-cells, to microscopic examination. Albumin or nucleo-

albumin may occur. Pappenheim, working with rabbits, found no change in the nervous system, lungs, or adrenal bodies. He found the liver and kidneys always damaged. The liver parenchyma showed less damage than the kidney. There was at times marked necrosis in the periphery of the liver lobule. The kidneys showed severe parenchymatous changes, often wiping out the cell structure. Small necrotic areas were noted at times in the kidney substance. Pappenheim noted enormous numbers of white cells collected in the lungs, spleen, kidneys, and particularly the liver, when the white blood-cells were decreased in the peripheral circulation as a result of benzol administration. From these facts he believes that the decrease in the whites is only an apparent one and is deceptive, as the 'pseudo-leucocytosis of the liver' shows.

Sohn has conducted some metabolic experiments with benzol on normal and leukemic individuals. He gave 4 to 5 grm. for three to five days, and demonstrated that the neutral sulphur in relation to the sulphates increased to 20-30 per cent. in place of 7-15 per cent. The urinary nitrogen decreased, with a slight increase in the ammonia.

Comparison of the effect of benzol with the results of *x*-ray treatment is inevitable. The original advice of von Koranyi and Kiralyfi was to combine the benzol and the *x*-ray treatment. Klein endeavored to make comparative studies. He ran through two series, one with benzol and one with the *x*-ray. In one case of subacute myeloblastic leukemia, the benzol was without any effect. The *x*-ray was tried with some reduction in the whites, but no improvement in the subjective or objective condition. The patient died after the eighth *x*-ray exposure. This type of leukemia, however, is particularly resistant to all forms of treatment. From the experience of the last two years, it is probably better to use the *x*-ray and benzol cautiously. Whether the two should be used jointly from the beginning, or one follow the other, has not been worked out with satisfaction. Jespersen⁶ reports a case of myelogenous leukemia where the patient had an intensive course of 100 *x*-ray sittings without result. This patient had an enormously enlarged spleen and liver, uneven temperature, hemorrhagic diathesis, exhausted general condition, pathological blood-picture with numerous abnormal elements, and a marked decrease in hemoglobin. He remained in the clinic for two months in an enfeebled condition and apparently near death. In the first ten days of the benzol treatment the white cells decreased from 250,000 to 61,000. The general condition improved, but the liver and spleen remained large. On the seventeenth day of the benzol treatment, hemorrhages from the mucous membranes necessitated the discontinuance of the treatment temporarily. It was renewed when the hemorrhages stopped, but given very cautiously. The white cells fell to 5,000. The liver and spleen became smaller, the

edema disappeared, the temperature became normal, the patient left his bed and became cheerful and active. Roessler⁷ also reports excellent results in 2 cases of leukemia after the failure of the *x*-ray and arsenic. After the benzol, the arsenic was of more avail. On the other hand, Tuerck reports a case of leukemia not yielding to benzol, but responding to the ray. Pappenheim thinks that neither benzol nor benzine has such a penetrating action as the *x*-ray, and further that it is not so elective. It is best when possible to use both methods, but in remote places or where expense precludes the ray, benzol offers a symptomatic remedy of promise.

The use of benzol has been extended to other conditions. Kiralyfi has applied it to the pseudo-leukemias, which he divides into the lymphomata and the granulomata. He includes under the lymphomata such conditions as Hodgkin's disease, lymphosarcoma, and, in a measure, Banti's disease. Tuberculosis and syphilis are types of the granulomata which Kiralyfi has tried to influence with benzol. The action of benzol in the granulomata is decidedly inferior to its action in the lymphomata. Benzol acts especially on the hematopoietic system and the bone-marrow, structures more involved in the lymphomata than the granulomata. In a case of lymphocytoma (a true pseudo-leukemia) Kiralyfi found benzol of benefit. The lymphatic glands were enlarged generally to the size of pigeons' eggs and the spleen was also large. The glands receded to the size of lentils and the spleen was reduced. The white cells dropped from 13,000 to 4,500. With this there was a gradual increase in the red blood-cells and hemoglobin. The qualitative blood-picture showed a slight relative decrease in the lymphocytes and a corresponding increase in the polymorphonuclears. The subjective feelings of the patient improved. Attention is called by Kiralyfi to the fact that these conditions are usually complicated by a nephritis. Moderate doses of benzol not only have not aggravated this condition, but the nephritic findings are actually improved. The albumin in the urine becomes less, the cases disappear or almost so, and the edema lessens or disappears. The rest in bed was, of course, a factor in the above improvement. The mass of glands that could be determined by percussion between the fifth and eighth dorsal vertebrae in the posterior mediastinum had completely disappeared, and in its place a clear percussion note was elicited. Three months after stopping the benzol, the white cells were 4,000, the red cells 4,500,000 and the hemoglobin percentage normal.

Cases of lymphosarcoma do not do well under benzol, according to Kiralyfi. The changes brought about in the anatomic conditions and the blood-picture are limited. Results are of limited duration. The results of benzol in lymphosarcoma are analogous to the action of the *x*-ray. Both of Kiralyfi's cases had two previous *x*-ray courses without avail. The glands decreased slightly at

first, but the change was not permanent. In a typical case of Banti's disease with splenomegaly, anemia, leukopenia, and a relative lymphocytosis, and a second case with the above findings but without the anemia, benzol was used for a long time without any change in spleen or blood-picture.

Benzol works better in the generalized than in the localized forms of pseudo-leukemia. In the generalized forms, there is a marked decrease in the glandular swelling, a decrease in the size of the spleen, and an approach of the white cells to normal when these are moderately increased. If the leukopenia occurs, it gradually disappears. The benzol results are lasting and are prolonged over many months. The localized forms (lymphosarcoma) react incompletely and temporarily. The glandular decrease is only moderate and not permanent. When a leucocytosis exists, the glands can be brought back to normal, but in a short time after stopping treatment they regain their former figure. In the case of the granulomata, the action of benzol is fleeting and incomplete. The glandular decrease remains but a short time, the decrease in whites is not permanent, the splenic enlargement decreases to a certain size, but this is not lasting. The *x*-ray, too, has a very unsatisfactory action in these granulomata. The splenomegaly of Banti's disease is not affected by the ray.

Schur^s tried benzol in a case with enlargement of the lymphatic glands, especially the mediastinal, the latter producing severe dyspnea. The liver and spleen were enlarged. The blood showed a polymorphonuclear leucocytosis. The patient had earlier and frequent treatment with the *x*-ray, which caused the glands to disappear, but they would always recur. Fever was occasionally present. Benzol was used three weeks in the same way and form as in leukemia with a disappearance of all the glands. At the time of the report, some months after stopping the benzol, they had not recurred.

The following cases, very briefly reported, illustrate the use of benzol in leukemia.

CASE I.—Female, *æ*t. fifty-five. Typical chronic lymphatic leukemia. All superficial glands moderately enlarged. Spleen and liver large; sweats, fever, progressive weakness, and loss of weight. The initial blood-count on January 22nd, 1913, showed 132,000 white cells, of which 91 per cent. were lymphocytes. Benzol was started at once with the following reduction in the white cells: January 22nd, 1913, 132,000, benzol started; January 29th, 119,000; February 5th, 132,400; February 12th, 47,000; February 19th, 40,300; February 26th, 27,200; March 5th, 11,200; March 12th, 3,200, benzol stopped; April 16th, 8,200. This patient began to improve from the outset in a most striking manner. The glands decreased gradually in size; the spleen and liver decreased; the sweating which had been very troublesome stopped at once; the patient gained in weight and her general weakness disappeared. At the time this patient was being treated, it was not known that the benzol should be discontinued before the white cells reach normal. This was not done in this case

until the count was 3,200, but there were no untoward results. The patient has remained perfectly well to all appearances (November 1st, 1913).*

CASE II.—Female, *æt.* fifty-three. Chronic myelogenous leukemia. First seen August 1st, 1912. Has had a bulging mass (spleen) in left hypochondrium for three years to the patient's knowledge. Progressive loss of weight, marked diarrhea, sweating, palpitation, weakness, fever, and digestive disturbances. The initial blood-count was 297,000. The myelocytes have ranged from 50 to 70 per cent. The following table shows the result of benzol administration:—

August 1, 1912,	297,000	X-ray treatment started and continued daily until August 30th, 1912.
August 7, 1912,	281,000	
August 13, 1912,	249,000	
August 21, 1912,	89,000	
August 28, 1912,	67,000	X-ray stopped.
March 11, 1913,	131,000	Benzol begun, 4 grm. daily.
March 18, 1913,	246,000	
March 25, 1913,	216,000	
April 2, 1913,	171,000	
April 10, 1913,	224,000	
April 16, 1913,	228,000	
April 26, 1913,	189,000	
May 9, 1913,	219,000	Benzol stopped.
Sept. 30, 1913,	438,000	Benzol commenced again.
October 21, 1913,	310,000	

Benzol has not been of value in this case. It should be stated, however, that the patient does not live in the city and the benzol cannot be pushed because daily observations cannot be made. The spleen has become larger since first seen, and now fills the abdomen to the pubes and considerably across the median line. The qualitative blood-picture has not been materially changed. There has been a gradual emaciation. Weakness, fever, and sweats are now present.

CONCLUSIONS.

1. Benzol is a symptomatic remedy of great value in leukemia.
2. The action of benzol is not restricted to certain types of leukemia.
3. The dosage should be from 3 to 5 grm. daily. It should be given mixed with olive oil or milk to lessen the irritation of the stomach. It should be given when possible after meals.
4. Benzol may produce symptoms of gastro-intestinal irritation, such as burning, flatulence, nausea, and vomiting. Dizziness, albuminuria, bronchial irritation, and mucous membrane hemorrhages may occur.
5. When benzol is not tolerated by mouth, it may be tried subcutaneously or per rectum.
6. Benzol first causes an increase in the white blood-cells, and then a marked fall. This drop may go below normal, and even

*April 1st, 1914, this patient is still symptomatically well. White cells, 8,000 per c.mm.

to a complete absence of white cells if the use of benzol is unduly prolonged.

7. The administration of benzol should always be stopped before the white cells reach a normal figure.

8. Benzol in moderate doses has a favorable effect on the red blood-cells and hemoglobin.

9. It is better, when possible, to combine the use of benzol with the x -ray.

10. Benzol has a favorable action to a limited degree on some types of pseudo-leukemia.

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PSYCHIC HARDENING.

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Introduction.—One of the signs of the broadening scope of our profession is evidenced by the passing of the old school neurologist. How he inspired our homage! The profundity of his anatomic and diagnostic acumen, the unattainable complexities of his nomenclature, his temerity in the mysterious domain of his erudite specialty, made him the object of our awe. But his prognoses, how hopeless they were, and the treatment he advised, alas, how insipid! A new school has now come. To-day neurology is a vital, practical branch of medicine. The modern neurologist links the physical, mental and moral. He conceives of and treats his patient as a unit.

Cæsar recognized "the effeminating influences of civilization." Never have the strides of civilized advancement been so rapid as now. In our fair land, the ease of accumulation has mingled a frenzy for work with a mania for pleasure. The intellect is forced in its growth by competition and ill-advised educational methods. The emotions are trained in kaleidoscopic disequilibrium by the unending thrills and climaxes of the daily news. The training of the will is ignored. So much of the necessity for self-denial and endurance has been taken from us by the unprecedented advances in mechanics and science, that to-day even the physician, to be fashionable, must be tender, even to weakness—wellnigh pampering in his attentions.

Nervousness.—So nervousness grows apace and neurotics multiply. Unquestionably to be of a nervous type, which is simply highly developed ability to respond to stimuli, is an advantage. Life presents far greater capacity for utility and pleasure in such a nature, but nervousness, which is an active response to stimuli plus reduction of inhibitory power, is truly disease, a handicap, a mental deformity, potent in the possibilities of unnamed suffering. The higher or psychic centres of the neurotic are dominated and domineered by the lower or vegetative centres, making the poor sufferer the helpless puppet of his bodily functions. Much of our modern civilization is but an inducement to the development of nervousness. Both through mind and body come the devastating influences; heredity ever plays its part; toxic materials are taken for stimulation or as sedatives; toxins are produced from unrecognized food intemperance, for when in the history of man has

the opportunity been so universal for daily feasting? Toxic irritants can but reduce resistance; mental irritants are even more potent—our business methods with the rush for wealth; our social exactions with their multiplied jealousies and irrational demands; the high pressure requirements of modern existence which even enter the home circle; much of our teaching which is called religious, but develops hypersensitiveness, indecision and morbidity, while for many, even pleasure is an intense and strenuous pursuit, whipping the mental with its games of chance, passionately seeking the novel and stimulating, until life is simply a whirl, a nerve-racking joy ride.

Eugenics is taught in a feeble way. Here and there a family lives wisely, sensibly, quietly, earnestly seeking calmness, temperance and discretion as guides for life, but with too many families home-making and child-training, the ideal of discipline, of work for work's sake, of poise and character growth, are untaught and unthought. This mother pets her child. It requires less trouble to give always, and never to deny, and the petted child becomes the wilful daughter. In another home, the paid nurse-maid determines the destinies of her charge. Ghost tales, the supernatural, appealing to the child's fear, she finds the easiest method of influencing her ward. The fearful child becomes the emotional adult. While again the worrying mother, untutored in her calling, wraps every so-called protection around her child to keep away this danger, and the other disease; her child, a hot-house product, matures morbidly hypersensitive. Thus the forces, which are working so relentlessly for nervousness, might be indefinitely multiplied.

From the earliest revelations of history, we find that the neurotic has been a problem. The demonology of the dark ages was an expression of this defect. For many years medical science offered no other treatment to the nervous patient than stimulation with its most potent drugs—alcohol and its compounds, *nux vomica* and its alkaloids, even coca with its vicious active principle being used to whip the nervous system; or failing thus, the ever-lengthening list of narcotics and sedatives was poured into the sufferer to mask the multiplied and diverse expressions of nervous irritability. Even to-day, many deal with nervousness as though it were but a physical disorder of the central nervous system, instead of an expression of the mentality. With the dawn of the psychic conception of nervousness, psychotherapy came to its own, but how tremendously has it been overworked, how ignorantly has it been employed, how viciously even has the psychic treatment of nervous disorders been abused. Any form of treatment which conceives of man as but physical, or as mental only, or as simply a spirit, is but fractional wisdom. While he remains in the flesh, man is a unit, even if in his nervous disorders mind, soul and body seem in a tangle. He

alone is wise and fit to help who recognizes physical, mental and moral defects, and, patiently rearranging and harmonizing these elements, restores unity.

Frequently we must change the body from a sluggish swamp of intoxication to a living spring of vitality. Mentally, the will must be reeducated or developed as the case may require, for the value of the will as a factor in nervous health cannot be overestimated. Often discipline from without must take the place, for weeks or months, of the lack of discipline within, while too often a moral purgation and a moral hypernutrition are as essential as the physical treatment.

In the study of the nervous, we find three common types—the hypersensitive individuals who are living in a constant emotional riot, reacting intensely to unnumbered stimuli and developing complete exhaustion, or falling into that miserable slough of narcomania—the drug and stimulant user. Then is noted that also large class who have altered man's normal, natural suggestibility into a perversion—individuals with acute ideational receptivity without rational poise. They are the hysterics, and when the idea of disease fastens itself upon the hysteric, the case is hopeless until some kind providence drives into that mind some other idea, stronger, more convincing and satisfying. And the third type, which we are prone to think is peculiarly a modern form is the unduly fatiguable individual, the nervously inadequate. He is the neurasthenic—ever on edge, irritable, exhaustible, miserable.

The writer has for some years been impressed with the necessity for a therapy which will meet, with lasting helpfulness, the needs of these nervous weaklings. To a simple, old-fashioned idea, he has given the term 'psychic hardening,' by which is meant a form of treatment, or better, a method of living which raises the nutritional processes to their highest perfection through active, wisely ordered physical work, which purifies the polluted stream of toxemia by simple, wholesome food, in moderate quantities, and which develops self-denial and perseverance through the daily doing of things which by preference one would leave undone. Lives so ordered made our forefathers the physical and mental 'salt of the earth.' It is the lot of the neurologist to-day to have referred to him many of the wrecks of life. What can be done for some of these is illustrated by the appended cases.

The Hypersensitive.—To deal with the hypersensitive, of which the following two cases are extreme examples, it is well for us to have the type clearly in mind. These patients have a passion for material comfort; to them the warm bed and the warm bath are of more importance than their children's moral rectitude; they suffer intense emotional disturbance from inadequate causes; they are ever appealing for the sentimental recognition of their suffer-

ings. Feeling constantly the so-called nervous tension, they frequently develop attention pain, that is, a discomfort uppermost and attended to when the interest is not otherwise diverted; and attention pains often grow in importance until they become truly the 'glorified pains of the hypochondriac.' They are truly weaklings. For these sufferers, the first helpful mental conception comes with the conviction that the nervous system is our ally and not our enemy. The next step is to learn tolerance of the disagreeable, to be followed by a doing of the disagreeable, at first per force, if necessary. Finally, the hypersensitive individual, who can regularly practise gratuitous self-denial, is well.

Over four years ago, Miss A. M., then thirty-seven years of age, was a perfect type of the hypersensitive neurotic. Reared almost in seclusion in an atmosphere of small town aristocracy, alone with a doting grandmother, her sense of sacrifice and duty being satisfied by inefficiently teaching a Sunday-school class, she grew into spineless womanhood, disturbed unquestionably for several years by an over-secreting thyroid—a perfect combination of physical and mental disorders, to produce over-sensitiveness, to which, unfortunately, later came a perverted sexual awakening, to perfect her downfall. At thirty-five she was almost a recluse, hypothyroidism having replaced hyperthyroidism, morbid, depressed, subject to prolonged crying spells, refusing to meet company, spending days in her room, bemoaning ostensibly her grandmother's death, wretched, wasted years; physically—soft, toxic, miserable; mentally—morbid, fearful, resenting help from all sources, selfish and indolent. Her family thought her mentally unbalanced. Her case was undertaken with the understanding that the strictest disciplinary measures would be supported by the family. Five gr. doses of thyroid extract daily for months, an alkalinized milk diet given in increasing amounts, larger and larger quantities of simple food; isolation with ample massage during her two months of rest and digestive re-education, gave her the physical foundation for recovery; the mental influence of a resolute, kindly, tactful nurse, who discussed with charity but without sentimentality, the patient's various mental deficiencies. The miserable sympathy-craving and its devitalizing influences were fully explained and the discussions of physical discomforts adjured in all her relations. The disease of self-pity which had destroyed her self-respect and made giving up to weakness an idol, bringing her finally to an invalidism which was cherished, fell before the science of rational thinking. The time came when the patient could make sufficient honest effort to help herself by discussing the moral perversion, and this resulted in practically a moral purgation. Thus, physically, mentally and morally the start for health was made. Then came the gradually increasing out-of-door exercise, and the battle with laziness, indolence and

love of physical comfort was on. A mile or two a day had been the extent of this lady's locomotion, and that at a languidly dignified gait. And here, after many weeks of satisfactory progress, advancement seemed to halt. She would not exert herself to the point of active rehabilitating exercise. Special orders were necessary, to the end that with the aid of two nurses slow walking became distinctly more uncomfortable than the four-mile-gait which won this important battle. To-day, this woman is absolutely another creature, independent, capable and leading a useful, normal, wholesome, helpful life—a life which includes a certain amount of daily physical work, drudgery if you wish to call it so, for her health's sake.

K. F. was born with 'a silver spoon in his mouth.' The only child of a line of high livers, with a straight history of four generations of alcoholism on his mother's and two on his father's side, his father dying before fifty of cirrhosis of the liver. In a home of wealth, the boy was denied nothing his body craved; a cigarette smoker at twelve, three local infections before twenty, 'dead drunk' when seventeen, and a tremendous eater of tenderloin steaks all his life, are some of the items of his history, indicating his heathenish rearing. He received his A. B. degree from Harvard at twenty-one and then spent two years of high living in Europe. Not long after his return, an impulsive marriage occurred. At thirty-two he had suffered three attacks of delirium tremens, had been a periodic drinker for fifteen years and a regular drinker for five years, averaging two quarts of whiskey, and smoking from thirty to fifty cigarettes a day. Of a naturally powerful physique, having weighed over two hundred, this young physical and mental giant had in these few years of unbridled licence been reduced to a pitiable, helpless, nervous weakling, living in a veritable hell when not narcotized by alcohol or nicotine. Withal a man of big heart, splendid ideas and not lacking in ideals, but a cringing slave to his intoxicated and damaged nervous system. After due authority had been rendered for his control, a gradual but rapid reduction was made in the use of alcohol and tobacco, kidneys and heart being carefully cared for by active skin elimination and hypodermic injections of spartein, while for the time the nervous suffering was modified by minute doses of duboisin. The digestion was encouraged by a mild stomachic and measured quantities of simple foods. At the end of ten days, no alcohol was being used and three rational cigars had taken the place of the forty comforters. The third week those hands which for a generation had not known toil, most reluctantly and gingerly essayed landscape gardening, which translated, means the pick, the shovel, and the wheel-barrow. Long before the six months of re-educational training had expired, a new life with a host of new possibilities had been revealed to this young man. He had accepted, as a necessary heritage from his forbears, a craving for

alcohol which it was useless for him to resist. In the face of this belief, no discomfort was ever borne or desire denied—his will had lain dormant. Fortunately, his intellect was of that keen quality, and through education so developed that he was entirely capable of realizing the rationale of his psychological and physical tuition. The pampering influence of the cigarettes, the damage of high proteid intake without adequate oxidation, the slavish dependence of a will that had no denial to the cry of desire, were fundamental thoughts which his denarcotized mind elaborated, and from which he developed a code of living which has made him a man of unusual efficiency in the business world, a man who for several years has been his own master. But the hardening process was not unlike that required to temper steel.

Suggestibility.—The type of the unduly suggestible, as influenced by disease, is one producing phases as multiplied as the sufferers. The mind so organized as to respond to every concept is truly a valuable possession, provided it be balanced and poised by reason; but the same mind dominated by the emotions is a damaging handicap, constantly threatened by psychic infection, the logical victim of the disease-monger, whether neighborly or professional. Such an inherent mental defect constitutes the essential factor in hysteria. As a rule, psychic analysis reveals an early damaging suggestion or disorder which was accompanied by some most stirring and hurtful emotion. About this root idea have clustered others, changing their relations and producing alternating phases, but at no time losing their perverting influences on their victim. The physician to-day realizes the individual's mental tendency, seeks out this original and frequently subconscious injury, and by persuasion or suggestion replaces it by a wholesome, constructive concept, overcoming the enthralling idea. Thus patience, courage, confidence, and health displace care, worry, fear and weakness in competent hands. Such work is frequently done by the family physician, though often unconsciously and through the power of a beloved and wholesome personality. The specialist accomplishes the desired end through systematic, but always individual methods.

The mother of M. B. died, when her child was five, of tuberculosis. The mother's family was hot-headed stock, capable of intense prejudices and prone to sulkiness. The mother's only brother was a chronic alcoholic. As a child the patient suffered with malaria during the summer months and had always apparently been anemic. The father was a minister, a man of excellent self-control, who did his best to protect his motherless daughter from the hardships of life. His thoughtfulness eventually provided her with an unreasonable, loveless step-mother. The home life became a small chaos—a patient father, an unsympathetic step-mother, an older brother who early found solace in drink, an impulsive fly-away sister, and

a frail, undersized, poorly developed patient. At eighteen, while at boarding school, she broke down and was sent home with 'nervous prostration.' Nearly two years of uselessness followed, in which the too kindly solicitude of the father was arrayed against the step-motherly fault-finding of the wife. Emotional depression of an unusual degree developed in this frail girl, and at twenty she was a sad, sickly, uncomplaining neurotic. At the outset of her breakdown, on account of scanty menstruation, the school doctor had suggested uterine trouble. The menstrual week for seven years had been spent in bed. Morbid fear caused her to refuse the suggested treatment for local relief; therefore, she was condemned by her doctors to invalidism. At twenty-one, however, she felt well enough to attempt a continuance of her studies, and in a brave effort to attend class while menstruating, the weakness of the flesh was manifested and she was carried to her room in a faint. This event marked another phase in the development of her disorder. Her sensation when she fainted in the school-room was of suffocation, and thereafter, with increasing severity, all emotional disturbance was accompanied with 'air hunger,' and on small provocation she would sigh and feel impelled to take deep inhalations to get sufficient air, while to menstruate meant to faint. The so-called fainting spells increased in frequency as other causes proved adequate to bring on a sensation similar to that experienced in the original discomfort. And so with pelvic distress, physical weakness, the startling fainting spells and the almost hourly necessity for forced breathing in order to satisfy her fancied need for oxygen, a body really frail and a home life devoid of that which could inspire a sensitive nature with hope or cheer, her condition was truly pitiful. Finally, the advice of a young physician was followed, and she was given hypodermic injections of morphine, until in the seeming necessity for its regular use, the father was taught to administer it, and for over two years she was kept alive, as her father thought, by this drug. He had been told that it was but a question of time and that morphine alone could prolong her life and make existence possible. She weighed 78 lb. when her father carried her into the hospital, and it was a brave man that left his daughter in the hands of strangers. He had been impressed recently with the injurious influences of what he decided was the drug, on his daughter's character. She was losing the honesty, sweetness and patience which had marked her life. The patient was indifferent, miserable, frail, now twenty-five years old, markedly anemic, and, as a result of the drug influences, hopeless and apathetic. By the usual means of supportive treatment, and the aid of a mild derelict and wholesome, frequent doses of castor oil, the use of the morphine was discontinued at the end of two weeks. A careful physical examination, to which the patient had rather listlessly

agreed, had revealed no evidences of chronic disease outside of that produced by the morphine and her poor blood-making. The mental examination had disclosed the origin of those ideas which had determined this chain of nervous disturbance. The nurse was carefully selected. The patient was kept in bed some weeks, carefully overfed, and with Swedish movements and active massage there was a decided gain in weight and some in strength. An effort had been made to reason away the disabilities. That this had not been successfully accomplished was shown by the fact that on her second day up, while walking across the room, she fell in a faint. The nurse, previously instructed, allowed her to lie undisturbed while she rang for the physician, meanwhile calmly making the bed. In a small room, the patient had fallen in the only place possible without striking some furniture. A single tear welled over each internal canthus and there was the least possible quivering of the eyelids. It was a hysterical faint. The patient was left in this sub-conscious state, the assurance being given to the nurse that such a faint was absolutely without danger and was best treated by deliberately ignoring its occurrence. The nurse was told to leave the patient lying as she was, locking the door, not to return until the patient rang, and that this treatment was always to be accorded similar attacks. Twenty minutes later the patient's bell rang and the nurse found her in bed. During the five years past there has been no recurrence. As soon as possible, a life of rough and tumble, out of doors in all sorts of weather, daily tasks to be accomplished in the face of this sensation or that, brought into this self-depreciating life a confidence which had in four months reached independence. At best, being undersized, she weighed but 100 lb., yet since that time she has kept the home, for misfortune has reduced the family means until a servant could not be employed. For over two years she nursed her step-mother, who was gradually dying of chronic nephritis, complicated by miserable mental changes, with the patience and ability of a trained nurse, even to the time of her death. To-day she leads a simple, wholesome, out-of-door life in the country, and is a most emphatic example of what psychic hardening can do in a case of hereditary physical and nervous deficiencies.

R. J. was a male hysteric. A Scotchman, a Presbyterian minister, æt. forty-nine, in whose life the root damage occurred at eighteen. It was a case of eyes. He was an earnest, hard-working chap, whose mind ground a little slower than the requirements demanded by his course of study. He got behind his class and his eyes began to hurt. He had not had trouble of this kind before, but it was wonderful what effects came from his eyes; he saw specks, and all reading, especially connected with his studies, caused much pain, a certain kind of type blurred and ran together and caused a drawing

sensation in the back of the head; when he got up suddenly a sense of dizziness caused him to reel. So he left school, and his history reports him as being practically a nervous invalid for ten years, after which protracted and satisfactory rest, he was able to complete his theological course and take up his life's work at thirty. Another symptom of his nervous susceptibility was an anomalous insomnia for which he, through a process of reasoning based upon a little knowledge of physiology, unfortunately incorrect, deduced a plan of treatment which he called 'inverting.' His conception of the physiology of sleep was that when we lie down more blood goes to the head, therefore if we did not sleep it was because of lack of blood in the head; ergo if there is not enough blood in one's head, invert! And so for twenty years this reverend gentleman had practised standing on his head for from three to ten minutes, if upon retiring he felt that the emotions of the day or preparations of the morrow would render sleep otherwise impossible. With grave assurance he told me that this never failed. These are two of a series of ideas that had modified and discounted this good man's life. The reformation was attempted with hesitation. A Scotchman usually holds to his ideas, and a Scotch Presbyterian certainly did not offer much encouragement as an opportunity for psychotherapeutic effort. A patient oculist, after exhaustive examination, found three-quarters of a dioptre of presbyopia with slight astigmatism. Somehow the confidence inspired by an unduly flattering recommendation of a churchman higher up, the necessity which was upon this poor man to get better or be penniless (he had a growing family), and the thoroughness and carefulness of the oculist's work, with the new sensation caused by the mydriatic, the assurance that his eyes were now correctly fitted, with adjustment of food to work and exercise, and the prescription of muscular work with a vengeance and no sermonizing, with normal sleep coming to a body too tired to invert, with some wholesome psychology and a few practical truths of righteousness unmixed with Calvinism, got into this good brother's mind a brand new set of ideas. At present he writes that he is carrying a heavy pastorate, writing his sermons without suffering, going to bed and sleeping like a normal man, and incidentally walking seven miles a day with an hour of energetic physical work, and in his diet doing homage to his digestive apparatus and not to his palate. This man was one of those common examples of ability using force against self. The melancholy of introspection rested upon him as a pall, while the many failures of the past had grown into a true anticipatory dread. Such was the handicap for over thirty years, because the idea of visual inability had made possible multiplied excuses for physical inefficiency. Grave, indeed, are the responsibilities of the physician in suggesting to the suggestible.

Fatigability.—Fatigability as an element of the neuroses is not, as its sufferers declare, a muscular or nervous inadequacy; but whether a latent weakness from bad stock, a real exhaustion from emotional waste, caused by friction and the erosion of damaging worry, or the not less definite reduction in efficiency through toxic damage, it is a disorder of energy, always associated with volitional defect. The degrees to which this psychic fragility may progress and its paralyzing effect on productiveness, together with the startling multiplication of its causes, as a result of the demands of our modern life, make neurasthenia a most practical problem. The relaxation which accompanies this disorder can only be followed by a mental flabbiness which robs life of all its worth-whileness. Anticipatory fatigue is a marked symptom of this disturbance. Many cases reach that phase when the thought of action or effort produces a weariness equal to that resulting from effort requisite to accomplishment in the normal individual.

A. had received his A. B. and was a junior in his theological course. His father had been a regular drinker, dying of Bright's disease at thirty-eight. The mother died of tuberculosis at twenty-five, when the patient was three years old. As a young man he was of an extremely social nature, bright, responding most energetically to his surroundings, and while in the university took his fling with the boys, drinking periodically until his senior year, when a profound religious experience entirely altered his life and turned his mind into most unselfish channels. His very conscientiousness now became a source of weakness, and he put forth double effort to make up for the college days he felt he had wasted in riotous living. Of good physique, he had for a number of years taken part in athletics, but now had no time. An attack of grippe early in the spring term was complicated by acute nephritis, but he pulled himself together in time to pass his examinations, and then found himself on the frazzle edge. His home physician found albumin and casts; and A. knowing the cause of his father's death, worries came thick and fast and his planned summer reading became a disheartening burden. He woke in the morning with a dread of all effort, and conscience drove him while the body and spirit limped. The shadows of depression lengthened. In spite of high ideals and a desire to practise Christian fortitude, he found himself on edge and out of harmony with life. He worried, and he worried because he worried, and finally he could lay his hand or mind to nothing which he felt able to carry out. Examination revealed the kidneys doing but 75 per cent. of their work, a mind being daily drained of its strength through fears and disabling anxieties, and a conscience burdened with a load of useless remorse. His very despair was his physician's opportunity. He felt himself sinking and he grasped the help offered with a tenacity which could but in-

spire one's best efforts in his behalf. With an almost liquid diet, the aid of eliminating baths, the renal insufficiency quite rapidly improved. The patient had given his word to carry out orders, and against all sensation of comfort and desire soon started working and walking. Dr. Walton's splendid little book, "Why Worry," with some wholesome counsel changed his point of view. In two months, this young man, thanks to his intelligence, realized his improvement. He was then given two months more of what could fairly be called strenuous life. August and September were spent in the mountains, clearing ground, felling trees, cording wood, burning brush and sleeping in the open. He got his daily cold dip in the mountain stream, and climbed a mile of mountain side daily for the gallon of butter-milk, which was his only medicine. He has since finished his theological course, and among other truths will preach the gospel of psychic hardening.

Miss P., one of the several daughters of a morose Methodist minister, was reared in a small town in northern Georgia, in an atmosphere of artificial sanctity and pathetic efforts at culture. She, with her sisters, was sent to a finishing school and received a veneer of education. The mother died after having done her best for her children. The moody father became more gloomy, the older sisters secured positions as teachers; and the patient for eight years quite unselfishly ministered to the physical needs of her morbid parent, leading a secluded, repressed, unappreciated life. So passed her young womanhood. Her father's death closed the home, and she essayed self-support by teaching a primary music class in a school for girls. That conscientiousness, which had made her her father's servant, held her in the grip of her school duties, where because of her poor preparation she worried about her work until exhausted. Her breakdown came in the spring, and with it a menstrual disturbance which took her to a gynecologist. The curettage was, of course, useless, serving only to elaborate her disability. Her fatigue increased rapidly from inability to exercise to deficient strength for personal care. For two years one of the older sisters ministered to her, while the remaining sister provided support for the three. Of course, these two years had not gone without treatment. The expense of the weeks in the hospital had been a heavy drain on their purse, still by self-denial a course of special stomach treatment was carried out and the eyes were thrice examined. An osteopath and his ministrations gave such relief that for six months he was employed as regularly as funds could be provided, but this expense could not be kept up and so loathfully his services were discontinued. A Science healer was less expensive, but in this case less helpful. Finally, the last condition was worse than the first. At thirty-six this woman had never tasted the joys of life, and had through honest though unwise efforts seemingly exhausted her

strength, and was an invalid. In body she was tall, stooped and slender. Mentally, she was an unusual combination of wilfulness, "due to her sickness," her sister said, and indecision. She reasoned well unless her personal interests were involved. The blessing, which should have been hers through the self-sacrificing care of her father, was alloyed by the feeling that he had selfishly robbed her of her girlhood rights and had been the author of her nervous disaster. From this belief she could not free herself. The sense of fatigue was now intense, the exaggeration of weakness complete. As a last resort, her sisters exhausted physically and financially, committed her to an institution for safe-keeping, and if possible, cure. That strength really remained was evidenced by a series of attacks on her nurse upon admission, for as a result of these long months of exhaustion, irritability had come to its own. This young woman, naturally docile, self-sacrificing, helpful, had through these years of pampering by her devoted sisters become an unreasonable, intensely selfish neurotic. Under treatment of the strictest disciplinary sort, she gained rapidly in physical strength; at times her exercise consisted of active physical contention with her nurse, probably as effective and strength-building as any form of exercise, and as the nurse was trained in handling obstreperous patients, the lessons which she learned during these weeks of isolation had a most beneficial influence. But strength came through this strenuousness and simple physical work; and, in the course of time, kindness and firmness with the suggestion of comfort earned and the persuasive power of privileges to be secured, later with encouragement and praise, and still later a sweetening of the sources of feeling through the development of a generous attitude toward her father's course were the elements of her restoration. In addition to this, real accomplishment was added to her mental stock by a thorough course in stenography to prepare her for self-support. During a year of treatment, the physical strengthened and toughened until she had become almost athletic and had developed not a little pride in wrestling with younger and stronger nurses. The second year she was able to take up and do with unusual satisfaction the first year's work in a training school for nurses. Again she resented the hardships of her probation months, but the same rigid insistence which had lifted her from a vapid, moaning, resisting burden, pursued her, and during her second year her work was of an unusual quality. She then secured a most satisfactory position in the president's office of a southern college, where she is to-day—happy, well, cheerful, normal, useful and productive.

Conclusion.—The writer has little to say in conclusion. The histories cited are but illustrative of numerous cases which will remain unaided by our profession until we are able and willing to treat the whole man. The neurotic will retain his miserable habits

in the face of chemical medication, receiving at best but a temporary relief from the most wisely written prescriptions for drugs. Until we can offer these multiplying sufferers value received, they will continue to glut the greedy maw of quackery, will remain the willing victims of 'isms' and cults, and will erect, finance and support the modern Grecian temples of Christian Science. We can, however, confidently promise lasting help to discounted lives, to useless invalidism, and to the thralldom of nervous suffering through judicious psychic hardening, which but teaches those simple lessons of rational living which make possible the joy of work, the potency of patience and the supremacy of self-mastery.

A CASE OF LEPROSY WITH ATTEMPTED CULTURES AND ANIMAL INOCULATIONS.

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While there are many cases of leprosy in the United States, the manner in which they are cared for in various states gives very little opportunity for observation or study of any large number at one time. Thus a case in itself is rather interesting to the average practitioner, and even dermatologists in some parts of the country see cases but very rarely. The following case is deemed especially worthy of report on account of the experiments carried on in connection with it.*

The patient was referred to Dr. Irvine in September, 1912, by Dr. C. M. Kistler of this city.

History.—A. P., single, *æt.* twenty-eight, occupation that of fruit handler. Father and mother are both alive and well, two brothers both alive, one healthy, one probably also has leprosy. Patient was born in Sicily and has had no illness other than the present. Has been in the United States between three and four years.

Present Illness.—This began about four years ago, the first lesions being on the anterior surfaces of the thighs, nodules later appeared on the forearms, backs of the hands and face. Lesions have never been painful and have never shown ulceration even following trauma.

Examination.—Patient is of average size weighing 135 lb. and well muscled. In general the lesions are symmetrically located and consist of round brownish-red tubercles or nodules varying in size from a small pea, as seen on the face, to one the size of a half-dollar on the right elbow. On the fauces is seen a small group of grayish glistening papules, each about the size of a grain of rice. Some lesions are of putty softness, others are hard and feel like cartilage in the skin; none seem fixed to subcutaneous tissues. On the anterior surfaces of the thighs are seen many round pigmented slightly atrophic scars where lesions had been. No active lesions are now present in this location.

No anesthesia is apparent except in the lesions themselves. Histological examination: Two lesions were removed for microscopical examination, one from the elbow and one from the forehead; both showed numerous acid-fast bacilli and typical lepra cells, confirming the diagnosis of lepra tuberosa. The nasal secretion which was abundant also showed numbers of acid-fast bacilli.

In view of reports by some authors of the improvement following the in-

*Demonstrated before the Minnesota Pathological Society, October, 1912.

jection of salvarsan, the patient was given 0.6 grm. on September 29th and the same dose repeated on October 7th. Following this treatment the patient's complexion appeared clearer, there was not so much bluish congestion in the skin of the hands, and some of the more recent lesions were perhaps softer. Patient refused to take more as he saw no benefit. Before treatment the Wassermann reaction was negative, and there was a leucocytosis of 14,000; some two weeks after the second dose of salvarsan the Wassermann reaction was positive and there was a leucocytosis of 17,000.

During the past two or three years a number of papers have been published, reporting the successful cultivation of the *B. lepræ*. As a number of these papers has been presented by men of unques-

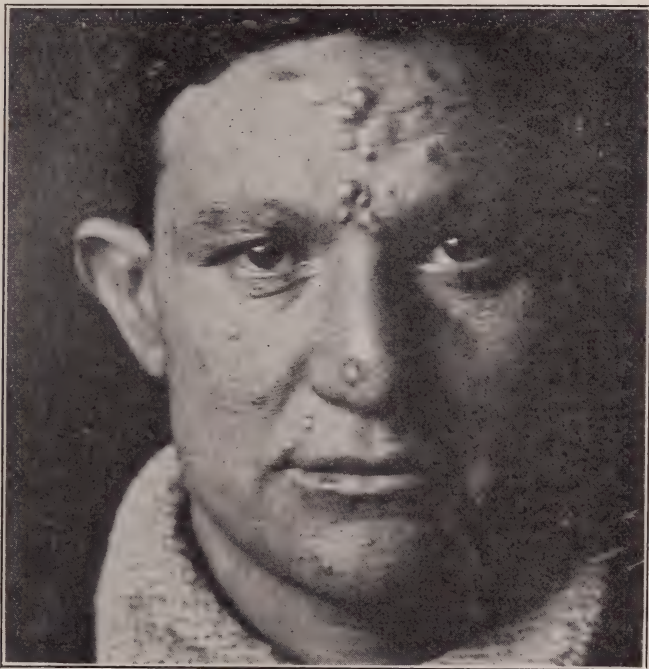


Fig. 1.

tioned ability, it has become a generally accepted fact that this organism may be readily cultivated. In fact, from the literature, one might gain the impression that the *B. lepræ* will grow on artificial media quite as readily as any indifferent saprophyte.

There is very little in the recent literature dealing with the bacteriology of leprosy from a negative point of view. In the *Lancet* of September 27th, 1913, Fraser and Fletcher published a report of 373 inoculations made from 32 cases of non-ulcerating nodular leprosy, in which they were not convinced that the *B. lepræ* ever multiplied on artificial media. These authors made inoculations on all the culture media that had, to date, been recommended for the

cultivation of the Hansen bacillus, but invariably with negative results.

The paper cited has given us courage to report the experimental work undertaken in connection with our case. Leprosy in Minnesota is not common, and until now we have only had the opportunity of studying a single case.

The patient was taken to the laboratory where all preparations had been made for making cultures and animal inoculations. The skin over a firm non-ulcerating nodule was cleaned thoroughly with



Fig. 2.

alcohol and ether and then painted with tincture of iodine. Wedge-shaped pieces of tissue were then excised under the best possible aseptic precautions and placed in a sterile receptacle. The excised tissue was then cut into small pieces about the size of a pea and some of these deposited upon the surface of Dorset's egg medium, and others upon coagulated horse serum contained in Petri capsules. A small quantity of a 1 per cent. trypsin solution (Fairchild) which had been sterilized by filtering through a Berkefeld filter was added to each inoculated capsule, which was then placed

in a moist chamber and incubated. Pieces of tissue were also deposited upon nutrient agar tubes which were sealed with paraffine before being incubated.

The pieces of tissue placed upon the media treated with trypsin were digested in the course of about ten days, and at the points of the tissue-deposits enormous numbers of acid-fast bacilli could be demonstrated.

Transplants were made to freshly prepared media (Dorset's egg and coagulated horse serum, to which trypsin was added as above described) by the simple means of transferring loops of the semi-digested medium, containing the organism, to the new media. After inoculations, varying from a few days to ten weeks, the transplants were examined and invariably acid-fast bacilli were present, but it was notable that they were far less numerous than on the original plates.

Transplants were again made from this 'second generation,' if it may be so called, until finally no trace of acid-fast bacilli could be found. It was evident that we were only transferring the bacteria which had been deposited upon the original plates by virtue of the tissue being digested, and that with each successive transplant we were diluting the loopful taken from the first plate. In fact, this was emphasized by the observation that still larger numbers of acid-fast bacilli were found in an agate mortar which contained a quantity of discarded leprous tissue which had been kept in the laboratory until the surroundings became unpleasant. Although this material had been infected with putrefactive organisms, it literally swarmed with acid-fast bacilli, which likewise failed to multiply upon artificial culture media after killing off the greater part of the putrefactive organisms by heating to 60° F., for forty-five minutes.

A series of animal inoculations was also made. Small pieces of tissue were placed in the anterior chamber of the tissue of eight rabbits. In another series of experiments tissue was ground in a mortar with sterile salt solution, and the emulsion injected into the testicles of four rabbits. In two cases the rabbit lost the eye, due to secondary infection. Otherwise the animal experiments were all negative. The animals were under observation up to nine months following the inoculations.

It is not our purpose in this somewhat brief report to convey the impression of attempting to refute the work of other investigators. That would be folly from the observation of a single case. Our experience, however, added to that of Fraser and Fletcher, convinces us that the *B. lepræ* is more difficult to cultivate than is generally assumed, especially by those who have not attempted its cultivation.

'OBLITERATING' TUBERCULOSIS.

By MARY E. LAPHAM, M. D., of Highlands, N. C.

We are taking it for granted that tuberculosis is handed down from one case to another exclusively through human agencies, and in combating tuberculosis we, therefore, place our whole dependence upon the prevention of this transmission. This does not seem to be at all an impossible undertaking but on the contrary perfectly feasible.

Governor Slaton in his proclamation calling for the observance of "Tuberculosis Day" voiced the prevailing belief in his words: "In order to obliterate tuberculosis." *Collier's Weekly* of May 24th, 1913, says "complete control of tuberculosis would then become merely a matter of sanitary organization." Miller says: "As long as tuberculosis is a communicable disease, so long will segregation which is best achieved in hospitals and sanatoria be the only logical protection for the community." In *Harper's Weekly* of September 13th, 1913, Dr. Huber says: "Preventive medicine has clearly demonstrated that such infections as tuberculosis, which now destroys every third or fourth adult life, can be removed from human experience. It, therefore, needs only that the political economist and the statesman shall ally themselves with the expert in preventive medicine for the great white plague to become but a ghastly and nevermore realized memory." Dr. Huber further says: "The essential specific cause of tuberculosis is the tubercle bacillus. This bacterium cannot multiply outside a living body except under laboratory experiments. If, therefore, we can prevent transmission of the tubercle bacillus from person to person, the consumptive to the well, we can eliminate the disease. Again, tuberculosis is not only a doctor's business, it has tremendous social and economic significance. If all sorts and conditions of men and women would get together to help the doctor in preventing the spread of the tubercle bacilli, we could eliminate tuberculosis from human experience."

Cabot says: "We must remember that if every existent case of tuberculosis could be hunted up and put in quarantine, the practical elimination of the disease could be confidently expected in the lifetime of one generation."

The State Red Cross Seal Committee of North Carolina says: "The cause of tuberculosis is from one who has the disease. The cause of this infection is carelessness on the part of the sick person."

Everywhere we find this same prevailing belief, that tuberculosis can be absolutely overcome by sufficient protection from infection.

Since this infection is menacing the health of one-twelfth of our total population and we have a million cases of manifest tuberculosis in the United States, it is of some importance to know whether the prevailing beliefs dominating our tuberculosis work are based upon inherited traditions or scientific investigations. What is the source of this infection and what do we know of the life history of the tubercle bacillus? When we remember that all our children are infected by tubercle bacilli by the time they reach maturity, we may well ask for all possible information concerning their origin, their modes of living, and why they so universally infect our children and at so early an age.

Is it likely that we can obliterate tuberculosis when all our children are infected by the time they reach maturity unless we can prevent this infection before it occurs?

What can segregation do to protect our children against this infection?

Let us first ask, what are tubercle bacilli, and are they exclusively resident in the human body? Is it true "that this bacterium cannot multiply outside a living body except under laboratory experiments"?

In the first place, the tubercle bacillus receives its name from its ability to provoke the production of a tubercle in the body of an animal. When bacilli settle down in the tissues of an animal and defensive efforts build a wall around them, shutting them in, a spherical body is formed called a tubercle, which gives its name to the disease. A diseased condition of any animal characterized by the production of tubercles, is tuberculosis, and any bacillus capable of causing the production of these tubercles is a tubercle bacillus, no matter whether these tubercles are produced in man or in the lower animals. Because the agent of tubercle production was first studied in man, is no reason whatever why mankind should have any exclusive right to the name of tubercle bacillus, and no reason whatever for characterizing other bacilli causing tubercles in the lower animals as pseudo-tubercle bacilli. No disease is so widespread and so common both to cold- and warm-blooded animals as tuberculosis. From the lowest form of animal existence up to man, the production of tubercles as a means of defence against acid-fast bacilli is a common phenomenon. It begins to seem as if the etiology of tuberculosis must not be sought merely in the dust of the street or sputum of tuberculous patients, but rather in the relationship of the omnipresent family of acid-fast bacilli to the tuberculosis of man. The etiology of tuberculosis is such a stupendous fact and so widespread and universal in its extent, that our efforts to explain the infection of our children seem paltry and almost unnecessary, since the universal presence of the infection should lead us to infer the impossibility of avoiding it. Long and learned papers discuss-

ing whether we are chiefly infected through the lungs, or through the intestines, will some day seem as ludicrously unnecessary as why water wets us or cold freezes, or any other absolutely apparent natural phenomenon..

Throughout the universe the presence of acid-fast bacilli is well-nigh universal. They grow on the leaves of trees, on the grasses and mosses, in slimy masses and under the most varied conditions of aqueous existence. Since everything that is eaten by animals, and the water that is drunk and the air that is breathed, contain these acid-fast bacilli, is it any wonder that the intestines of the lower animals are constantly infested with them, or that they should now and then enter the blood in sufficient numbers to cause disease? Would not this be an entirely natural explanation of the relation of food-supply to the presence of acid-fast bacilli in the tissues of the lower animals? Does not this suffice to account for the tuberculosis of snakes, lizards, turtles, frogs; of pigeons, chickens and birds; of pigs, sheep, cats, dogs, cows and monkeys? Why should there be an impassable gulf between cows and man? Why should not the universal cause of a universal result in other animals be true of man, when we find the same cause and the same result? What is the relation of our tubercle bacillus to the rest of the acid-fast family? Is it unique and alone in its ability to cause the tuberculosis of man, or can any member of the great acid-fast family be modified by the residence in any host, so that it can induce disease? Is it likely that the tuberculosis of all the different species of animals is in each case caused by a sort of sealed transmission from one case to another, or would it not seem much more probable that it was in all cases the common expression of a common cause? Are the pathological properties of an acid-fast bacillus immutably inherent or capable of mutation through a change of host?

Our confidence in the immutability of Koch's bacillus must take notice of the fact that the protein molecules of all tubercle bacilli are singularly unstable and unreliable. A strain of human tubercle bacilli obtained from Paris will differ more in the character of its protein constituents from those characteristic of the tubercle bacilli of Germany than will the acid-fast bacilli growing in the native fields of the patient. The optimum temperature of the human tubercle bacillus is readily reduced to twenty by residence in cold-blooded animals. The complement fixation test, which so completely separates the acid-fast bacilli from all other families, is powerless to accomplish a group differentiation. An agglutinin or precipitin from any acid-fast bacillus will cause biological reactions in any animal infected by any other acid-fast bacillus. The identity of tubercle bacilli can only be disproved by cultural characteristics. It is quite possible that the importance of cultural tests has been exaggerated, and that the great value of biological identity is not

sufficiently appreciated. The life history of our tubercle bacilli markedly confirms these suppositions. Beginning as endospores, capable of resisting 100° C., and severe dessication, it develops into a bacillus almost indistinguishable from the coli-typhoid group. It is not acid-fast, but Gram positive; is aërobic or anaërobic, and when inoculated into guinea-pigs causes typical tuberculosis of the liver, spleen and lungs. Under these conditions, it develops into a bacillus closely resembling Koch's in shape and size, and finally into the adult acid-fast organism. All these stages may be represented in the tubercle, and frequently all are present in tuberculous sputum. Without an adequate knowledge of the life history of our tubercle bacillus, of what value are our statements concerning human transmission and exclusive residence in man?

It is quite possible that beliefs based only upon knowledge of the adult bacillus are entirely inadequate to the situation. Take, for instance, our comprehension of the closed case. We say that the patient cannot spread infection and is, therefore, free from danger to others, when we do not find tubercle bacilli in the sputum. This simply means that the adult forms are not present, but takes no cognizance of the immature forms, which may equally well be present, and are even more dangerous.

Before we can say anything definite concerning the etiology of tuberculosis we must know more about these immature forms, and how it is possible that they can be present in the tissues of the prematurely born, when there is no history of tuberculosis in the family. An analogous case may offer some explanation. We are all of us at times infected by colon bacilli, but they seldom do us harm. Now and then they cause irritation of the bladder or kidneys or liver or lungs, or even the brain. Would we ever attempt to prevent this inevitable infection by colon bacilli?

May it not be possible that acid-fast bacilli are equally present in the intestines because of their universal presence throughout nature, and that, like colon bacilli, they may enter the blood-stream and become diffused throughout the tissues even of the unborn babe? That the infection by tubercle bacilli can be transmitted through the intestines has been proved by the fact that there are over two hundred thousand children in the United States infected by tubercle bacilli derived from the milk of cows. Here is a perpetual source of infection not dependent upon human transmission. In our efforts to obliterate tuberculosis, shall we obliterate cows? Or can we sterilize cheese and butter as well as milk? The cows are a valuable source of information to us concerning the pathological properties of tubercle bacilli, for they continually excrete these bacilli in the urine, feces and milk as a perfectly normal phenomenon, because when slaughtered tuberculous lesions are not found. We can remove all tuberculous cows from our herds, but we can never protect

the others from this universal infection. The fact that cows are so commonly infected and so seldom harmed corresponds with the fact that over 90 per cent. of all our children are infected with tubercle bacilli, but that only from 1 to 2 per cent. manifest tuberculosis and die. This discrepancy between the percentages of infections and deaths can be explained by the harmlessness of the tubercle bacilli in the majority of cases.

We find tubercle bacilli in the excretions of apparently healthy people, when no tuberculosis can be detected by the closest examination, even when aided by the *x*-ray.

The smegma bacillus, the acid-fast bacilli of feces and urine and sputum, blood, are said to be non-related to the tubercle bacillus, simply because there are no lesions to account for their presence. It is quite possible that these acid-fast bacilli are excreted as the result of a harmless infection precisely as they are with cows. When do these infections constitute tuberculosis, and why?

Some babes are born with cavities in the lungs, and one per cent. of all the newly born die during the first year of life. Is it possible that on account of some flaw these infants die, not because they have been exposed to infection, but because they have never established the ability to live in security with tubercle bacilli? The inability of the child to resist the infection may be manifested, and an antituberculous regime established that corrects the fault. The sickly child is fortunate, because the danger is appreciated. The well child—the child that in no way suggests the danger—goes on until it drops, whenever that may be, whether in early manhood or adult life. If the flaw is there, the date of its manifestation will depend upon an infinitude of factors, as to whether it is hastened or indefinitely postponed. A lesion so small as to be recognized only with difficulty by the *x*-ray may affect every part of the child's body; or a process may go on developing in complete compatibility with perfect health and strength, when the victim drops as if struck by a blow.

The writer has under her care to-day six men who were perfectly well until they went to a doctor for malaria, biliousness, etc. These men never felt better in their lives. To all appearances they are well, and it is almost impossible for them to believe that both lungs are seriously involved.

Since 40 per cent. of all cases of tuberculosis are perivascular or peribronchitic in their nature, and cannot be detected by physical signs until sufficient infiltration reveals itself, it is evident that an examination of the lungs is as inadequate to make the diagnosis of tuberculosis as the absence of tubercle bacilli in the sputum.

The development of a tuberculous process in a perfectly well child is exceedingly dangerous, because it will not be discerned

until too late. The only way to protect the wage-earner and our future citizens is to examine each one regularly, at stated intervals, to see whether they belong to the ninety and nine that are safe, or to the one that is lost. This is a huge undertaking, and one that requires long preparation for its comprehension. In the meantime if every doctor would resolutely determine that a thorough search for tuberculosis should be made in every case, no matter what the condition of the patient, some idea of the number of these concealed cases might be obtained, and if reported, we should begin to have some idea of what this disease means that is costing us one million lives yearly.

Allowing \$100.00 for each life—\$100,000,000 seems enough to repay a scientific investigation of the life history of our enemy. At present we are accepting inherited traditions, and basing all of our work upon them. Suppose these traditions are inadequate. Suppose that free sanatoria and segregation cannot check tuberculosis because its origin is too universal. If infection is inevitable, let us recognize this fact and work from it.

According to Orth, there are two hundred thousand children in Germany with bovine tuberculosis. As our population is greater than Germany's, this number with us should be three hundred thousand. Three hundred thousand children dying with tuberculosis derived from cows! Can segregation or quarantine protect them?

Are we depending too exclusively upon reasoning by analogy? Do we infer from the efficiency of quarantine in preventing small-pox, cholera and other communicable diseases, that tuberculosis will be similarly affected? Is it possible that in the future we shall regard tuberculosis less as a communicable and more as a universal disease? Shall we try to prevent an unpreventable infection, or to arrest its development by discovering it in time? We know the value of early detection; do we sufficiently appreciate it to base our future efforts to prevent tuberculosis upon systematic efforts to detect it?

Suppose each child was required to present a certificate from an authorized expert each year as to its freedom from tuberculosis. What effect would this have upon our future crop of consumptives? Should we find that we had cut off the supply at its source? As it is, we let the supply develop and accumulate, and then, after the harm is done, we attempt to overcome it.

We are working at the wrong end. We should prevent destruction, not repair it. The systematic examination of each child, sick or well, will furnish valuable data for tuberculosis statistics. The records will show how well the work is done, because whenever a case may manifest itself, or whenever it may be examined, the original reports may always be found. If our examiners are not

equal to their task as proved by their reports, they will have to be changed.

The State Boards of Health should disseminate scientific information, not traditions, among their people, and educate them up to the necessity for vital statistics and regular examinations. The State Boards of Health are not sufficiently informed as to the best scientific knowledge of tuberculosis, and the people are not properly led.

We need, first of all, a scientist to show us the way; someone in the South, who shall do for the life history of acid-fast bacilli what has been done for the malarial organism. In no way could the South make a better investment than by paying such a man well to inform us as to the truth of exclusive residence in man.

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AUTOGENOUS NEGATIVE PRESSURE.

By WILL-WALTER, M. D., of Chicago.

Some years ago the writer elaborated a series of suction appliances attached to a negative pressure pump for use in ear, eye, nose and throat applications. These were manufactured by Sharp and Smith, of Chicago, who were good enough to give some time to their perfection.

Careful manometric measurements of the pressure exerted through the by-pass instruments, such as are attached to compressed air tanks or to water faucets, show great variability in, and frequently excessive, pressure. Although the writer's own pump instrument at that time showed less variability and excessive pressure than is exerted by by-pass instruments, the pressure was more than is safe for mucous and skin surfaces. Small blebs of blood occasionally occurred on the mucous surfaces in the nose following its employment, and in the ear there were 'blood blisters' at the turn of the external auditory canal just without the tympanum, which obscured the view subsequently and even blocked drainage.

Led by these ill effects the writer evolved and has used for three or four years what he has termed *autogenetic negative pressure*. This has not only the advantage of lower pressure, but is so under the patient's own control and so subject to his own sensations as to make it not only more effective but safer. Its simplicity should appeal to all, and because of this simplicity the writer has never thought it worth while reporting. However, it is given here because a number of physicians, to whom the writer demonstrated the method, urged him to publish it on account of its originality.

Negative pressure may be applied autogenetically to the nose, throat, chest, and the Eustachian orifices, by simply holding the nostrils closed as for Valsalva, but with this difference that the breath is drawn in and held instead of being blown out.

For diagnostic purposes the head should be tilted away from the affected side to aid flow, exhaling with the nostrils closed, then attempting to take breath and holding it under suction as long as possible.

This offers the simplest and most expeditious method the writer knows for aspiration from the anterior ethmoid cells or from the frontal or antrum sinuses through the infundibulum, or from the posterior ethmoid or sphenoid cells, both for diagnostic and therapeutic uses.

For therapeutic purposes, patients are instructed to employ this method at home, and with care and training may, by manipulation of the throat and mouth muscles, determine the maximum effect to fairly well defined regions.

If we realize that the value of negative pressure lies not so much in its power of aspiration as in the production of hyperemia, by which according to the theories of Bier an increased supply of blood is carried through the affected area, we can readily see how it may be brought to bear upon all forms of rhinitis, pharyngitis, laryngitis, Eustachian salpingitis, in affections of all sinuses, and even in tracheitis and bronchitis, where negative pressure, in imitation of the rarified air of high altitudes, is of value. Marked increase in the strength of the diaphragm will supervene with practice. Patients are urged to employ it repeatedly in early stages of infection.



Fig. 1.



Fig. 2.

For sneezing and the primary irritation of rhinitis it affords quick relief.

Applied to the external auditory canal by the method described later on, autogenetic negative pressure is of great value in otitis. Early in the acute stage, before perforation, it relieves pain and occasionally aborts the attack. After perforation it shortens the attack and relieves pain, improves drainage, and often keeps free an opening which would otherwise close. It aids also, by alternate suction and pressure, those forms of immobilization of the ossicles where massage seems indicated, and is a good substitute for the complicated aural massage instrument.

The method of application consists of the use of a mouth-piece, a short length of gum tubing, and a specially blown glass appliance, as shown in the illustrations: Fig. 1 usually employed for aerspiration, and Fig. 2 for aspiration, the receptacle being large enough to hold quantities of the discharge. These go by the names of auto-aural-aerspirator and auto-aural-aspirator.

The appliance is provided with a bulge midway in which cotton wool is placed to block the discharges. This method of protection is employed by laboratories dealing with organisms where suction pipettes are used, and has been proved safe for the user.

The aerspiration is recommended for furuncles of the external auditory canal, and is a most effective remedy for their relief.

The third application of the autogenetic aerspirator is to the eye, by means of a proper shaped suction cup (Fig. 3). This aids in all affections of the conjunctiva, lid and lachrymal sac where negative pressure is indicated, and affords a simple method of application. Corneal ulcers are distinctly benefited by its employment. The writer would commend this cup also for supra-orbital headaches from eye fatigue where the skin muscles are tense and exhausted; also for pimples about the face, and for furuncles anywhere. Early applied and persistently, the suction delivered to the cup will abort these annoying lesions.



Fig. 3.

If we clearly comprehend the thought that what we must do is to prevent the initial stasis of infection by quickly producing hyperemia, whether by heat or by cold or by this most excellent of means, 'negative pressure,' we shall make a distinct gain.

Autogenetic negative pressure was used by all of us in boyhood days when we sucked the injured part. By the simple means here shown we may bring the method instantly into action in eye, ear, nose and throat; and the earlier it is employed and the more persistently the better, if we would avoid the stasis which lengthens and complicates cure.

Elaborate forms of suction instruments may be used in offices, though most of them are too severe. The methods here described can be used by the patient himself, and they are quite as effective and much safer.

THE MOST FREQUENT SPECIFIC GRAVITY OF THE URINE IN TWO HUNDRED AND SEVENTY EXAMINATIONS.

By JOHN C. WARBRICK, M. D., of Chicago.

In making an examination of the urine for any of its constituents, there seems to be one factor that has to be always taken into consideration, in every instance, almost as a necessity and also as a routine practice, and that is the specific gravity. This is about the first point to be considered in most cases except perhaps a glance at the appearance of the urine. The specific gravity, of course, may indicate something and be normal or somewhere near it—high, very high, or low and very low; but especially if very high or very low it may have some significance.

A good deal of variation, however, from the normal specific gravity of the urine, ranging as it does from about 1015 to 1025, may be regarded as consistent with good health, as is only natural, for certain conditions tend to modify or affect it daily from time to time, as, for instance, the drinking of plenty of water tends to lower it, while abstinence from water tends to increase it; and the same is true of exercise and food, which also have some influence on it.

We might expect to find the specific gravity of most urines to fall somewhere within the range of 1015-1025, while some specific gravity figures, of course, will be found to occur more frequently than those of others, the tendency apparently being for the specific gravity to be high rather than low and for the higher figures to repeat instead of the lower. In order to find out what specific gravity occurred most frequently and the number of times each one repeated, an examination of 270 different specimens of urine was made.

The specific gravity ranged all the way from the low figures of 1,000 to the high point of 1,030. During these examinations it was found that the medium specific gravity of 1,020 occurred the greatest number of times, being recorded no less than fifty-three times.

An increased specific gravity of 1,024 followed next, occurring less frequently—thirty-two times. Next follows a specific gravity greatly decreased at 1,010, which occurred less often—twenty-five times. The frequency of all the specific gravities, however, will be seen in the following table, and it may be interesting to compare the figures.

It seems rather strange that, while the specific gravity of 1,024 occurred thirty-two times and the specific gravity of 1,026 twenty-one times, and other specific gravities almost as frequently, the specific gravity of 1,023 should occur so seldom as three times, and that the same should obtain in regard to the specific gravity 1,025, which was found only twice in the 270 urinary examinations.

Specific gravity	1,020	occurred	53	times.
Specific gravity	1,024	occurred	32	times.
Specific gravity	1,010	occurred	25	times.
Specific gravity	1,012	occurred	24	times.
Specific gravity	1,030	occurred	24	times.
Specific gravity	1,022	occurred	23	times.
Specific gravity	1,026	occurred	21	times.
Specific gravity	1,028	occurred	19	times.
Specific gravity	1,016	occurred	19	times.
Specific gravity	1,014	occurred	17	times.
Specific gravity	1,015	occurred	3	times.
Specific gravity	1,023	occurred	3	times.
Specific gravity	1,008	occurred	2	times.
Specific gravity	1,025	occurred	2	times.
Specific gravity	1,004	occurred	1	time.
Specific gravity	1,011	occurred	1	time.
Specific gravity	1,000	occurred	1	time.

TENDON REFLEXES AND BONE REFLEXES.

By DR. J. BABINSKI, of Paris,

Lectures delivered at the Hospital de la Pitié, reported by Drs. Albert Charpentier and J. Jarkowski, and reviewed by the author.

(Translated, with some additions in brackets, by
CHARLES GILBERT CHADDOCK, M. D., of St. Louis.)

Dyscrasias, Infections, Intoxications.—We have already seen that in the anemic and the tuberculous, the tendon reflexes are generally lively. In tuberculosis they may even become clearly exaggerated (Struempell has noted the fact and Claude has reported one case). It is possible that one has to do here with excitation of the pyramidal system by absorbed toxins, as has been supposed. In poisoning by strychnine, exaggeration of the tendon reflexes is one of the most striking symptoms.

Epilepsy.—During the epileptic attack and for some time after it, we may find surreflexivity which is manifest, in particular, by ankle-clonus.

Peripheral Lesions.—Can the various forms of neuritis induce bone and tendon surreflexivity? Certain authors maintain that they can, Struempell among others. I am not convinced that they can. But irritation affecting the extremities of sensory fibres seems to be able to determine exaggeration of the tendon reflexes; at least by this mechanism we may explain the surreflexivity sometimes seen to follow lesions of bones and of joints. In these circumstances, the exaggeration of the reflexes is the more striking since it is usually associated with muscular atrophy. Besides amyotrophy without reaction of degeneration, without fibrillary contractions, and without paralysis, when accompanied by surreflexivity, is almost always the consequence of an alteration of a bone or of an articulation. The surreflexivity in such a case predominates in the region near the lesion which is the starting point: arthritis of the ankle-joint provokes especially exaggeration of the ankle-jerk, and there may be ankle-clonus; arthritis of the knee determines first exaggeration of the knee-jerk; but very often a lesion implicating one of these articulations, or even the hip-joint, causes exaggeration of all the tendon reflexes of the lower extremity.

The Association of Causes, Some of Which Induce Surreflexivity, Others, Irreflexivity or Subreflexivity.—The association of causes,

some of which provoke surreflexivity, and others irreflexivity, may occur in two very different ways: sometimes each of the affected reflexes has been altered by a single one of the disturbing causes, and then the association consists of a coexistence of some exaggerated and other weakened or abolished reflexes; sometimes a given reflex has been subjected simultaneously to the influence of two causes which are antagonistic with varying results.

The association of organic hemiplegia and tabes makes a condition in which the causes of surreflexivity and irreflexivity are joined. This complication has an effect on the tendon reflexes dependent upon the state of them before the occurrence of the paralysis.

The following are some of the types that are observed: (a) The tendon reflexes in all four extremities were completely abolished before the hemiplegia occurred. As a rule, in such cases, the lesion of the pyramidal tract has no effect on the tendon reflexes. We understand, of course, that irreflexivity due to a profound alteration of the [primary reflex] arc is irremediable and final. However, there are cases reported in which irreflexivity has given place to subreflexivity on the hemiplegic side. In such cases, without doubt, the radicular lesions were not extensive and were superficial.

With regard to this point, I recall an experiment of Westphal: In the rabbit he cut two or three posterior roots belonging to the reflex arc of the patellar tendon, which caused irreflexivity through this arc. He then injected strychnia, and then obtained a return of the reflex.*

(b) The tendon reflexes were not abolished but simply weak. Under the influence of sclerosis of the pyramidal tract the subreflexivity may become attenuated, disappear, and even give place to surreflexivity.

(c) Take another example: the knee-jerk, before the stroke, was present and the ankle-jerk abolished. In this case we may see, some time after the stroke, on the hemiplegic side, exaggeration of the knee-jerk which is in contrast with the abolished ankle-jerk. An inverse type, which consists of exaggeration of the ankle-jerk with abolition of the knee-jerk, while not impossible in tabes, must be very exceptional, for, as I have already remarked, in tabes it is very rare to have a normal ankle-jerk when the knee-jerk is abolished.

(d) The following is a very common association of hemiplegia and tabes: The reflexes of the lower extremities remain abolished

*[The details of this experiment are not here given with sufficient completeness to determine its value. The operation on the cord may have temporarily abolished the reflex, which would have reappeared without the influence of strychnia.]

after the stroke; the reflexes of the upper extremity [paralyzed side] which were before normal, become exaggerated.

(e) Finally, I wish to point out a combination that is quite frequent and especially interesting. Before the stroke, the knee-jerk, the ankle-jerk, and the reflex of extension of the forearm on the arm are wanting; but, on the contrary, the reflex of flexion of the forearm on the arm is present. After the stroke, this contrast is found: all the reflexes on one side are abolished with the exception of the reflex of flexion of the arm, which is exaggerated. Besides, here may be seen in all its intensity the 'paradoxic reflex of the elbow.' This sign, as we have seen, may be found in tabes without an associated hemiplegia, but when this association exists, it is especially striking because of the exaggeration of the reflex of flexion. Souques was the first to draw attention to facts of this kind.

I will say, in passing, that I have observed the paradoxic reflex in cases of hemiplegia unassociated with radicular lesions, and in which the reflex of the brachial triceps was not only present but even exaggerated. In such a case the results of percussion vary in accordance with the weight of the blow. If the shock is slight and affects no more than the tendons, energetic extension of the forearm occurs; if it is heavy, the bone is excited and there is a contraction of the flexors of the forearm which predominates over that of the extensors.

Returning to our subject, in the examples I have chosen I have assumed that the hemiplegia followed tabes, and this is the commonest eventuality. We have seen that subreflectivity might be overcome, but that irreflectivity was often unchanged. The occurrence, then, of sclerosis of the pyramidal tract does not by any means necessarily modify the state of the tendon reflexes due to tabes.

When, as happens more rarely, the tabetic root-lesions of tabes occur in a person already affected with a hemiplegia with descending degeneration, the state of the tendon reflexes undergoes almost always a notable modification. The exaggeration diminishes and gives place to subreflectivity, and, when the lesions are profound, to irreflectivity.

It may be said, then, that in general, in this conflict, the conditions tending to produce irreflectivity finish by overcoming the antagonistic conditions.

In Friedreich's disease, where the lesions of the reflex arcs are associated with sclerosis of the pyramidal tracts, the conditions causing irreflectivity always prevail over those tending to induce surrefectivity.

The surrefectivity which is one of the most usual symptoms of amyotrophic lateral sclerosis is sometimes replaced by subreflectivity when the lesions of the anterior horns of the cord, inducing

amyotrophy, become intense. Here the interpretation of the transformation of the state of the reflexes is very simple.

In the conditions I have thus far considered, a given tendon reflex was shown to be susceptible of undergoing simultaneously two antagonistic influences, one tending to induce surreflexivity, the other, irreflexivity. In cases now to be discussed, the tendon reflexes, considered in relation to others, are subject to opposing influences, but each reflex is affected by a single pathological cause.

Take, for example, a lesion of the lumbar enlargement of the cord at the level of the third segment, causing abolition of the knee-jerks. If this lesion irritate or destroy the pyramidal tracts, there will be induced, as another result, exaggeration of the ankle-jerks. This relation is the inverse of that sometimes seen in tabes associated with hemiplegia, which has already been pointed out.

But from the point of view which especially concerns us here, it is the lesions of the cervical cord which merit our particular attention.

Let us assume that we have to do with a lesion of the cervical enlargement (meningo-myelitis,* pachymeningitis, Pott's disease, or tumor). Let us assume that this lesion has either a destructive or a disturbing influence on the pyramidal tracts. What then do we note? The tendon reflexes of the lower limbs are usually all exaggerated. But the reflexes of the arms are in quite a different state, their modifications being dependent, in large part, on the longitudinal extent of the lesions. The reflexes of the arms may be abolished. For this, the anatomical changes must extend at least from the fifth segment, the centre of the reflex of the forearm on the arm, to the eighth cervical segment, the centre of the reflex of flexion of the hand and of the fingers (Table I). Otherwise, the irreflexivity of the upper extremity is only partial, and then almost always we find "inversion of the radial reflex," which has already been referred to in the discussion of pure irreflexivity, but which here is seen in much greater perfection. In order that this inversion appear with all clearness, three conditions are necessary: (1) There must be a lesion of the fifth cervical segment; (2) the eighth cervical segment must be intact; (3) there must be disorder of the pyramidal system above the eighth segment. What, then, is the condition of the intermediary reflexes—that of extension of the forearm on the arm and that of pronation—in these cases of inversion of the radial reflex? Ordinarily, they are both abolished when the lesion implicates the fifth, sixth, and seventh cervical segments. On the contrary, they are both exaggerated when the lesion affect the fifth segment and no others. Finally, one of them may be abolished and the other exaggerated; and in such a case, one

*If I can trust my observations, luetic meningo-myelitis of the cervical region is quite common.

may justly conclude, a priori, that it will be the reflex, the centre of which lies nearer the fifth segment, that will be abolished. If accepted views are followed, the reflex of extension should be the one abolished. But researches made in my service by my interne, Dr. Gendron, in quite a large number of cases presenting inversion of the radial reflex, have established the fact that the reflex of extension was sometimes exaggerated, while that of pronation was abolished; and no case was met in which, with the reflex of extension abolished, that of pronation was exaggerated. It follows from these observations that the centre of the reflex of pronation lies above the centre of the reflex of extension of the forearm.

This discussion shows that methodical examination of the reflexes of the upper extremities, usually neglected, gives information which often reveals and localizes with remarkable precision lesions of the cervical cord.

Tendon Reflexes and Cutaneous Reflexes.—I shall consider the cutaneous reflexes only in their relation to the tendon reflexes, the latter being the single subject under discussion. But before undertaking the study of these relations, I think it indispensable to recall certain fundamental facts in regard to cutaneous reflectivity.

First, then, a few words about these reflexes in the normal state.

It is well known that excitation of the skin on the upper and inner portion of the thigh causes an upward movement of the testicle [on the same side]—the cremasteric reflex.

Excitation of the skin of the abdomen causes motor reactions which vary with the place excited. Three abdominal reflexes are distinguished: the inferior, the middle, the superior.

Slight excitation of the sole of the foot usually causes flexion of the toes on the metatarsus and contraction of the tensor vagina femoris, as Brissaud pointed out; more severe irritation causes, besides, reactions in the muscles of the lower extremity, shown principally in flexion [dorsal] of the foot, of the leg, and of the thigh. This movement is quick, of slight degree, and of short duration.

With regard to the intensity of these reflexes, there are individual differences. In certain perfectly normal persons, the abdominal and plantar reflexes seem to be wanting; in such persons the irreflexivity is bilateral. From this we must conclude that the absence of any appreciable reaction, after excitation of the abdominal wall or of the sole of the foot, when found on both sides, is not a certain sign of a pathological state.

I would call attention to another muco-cutaneous reflex, the anal, which consists of contraction of the sphincter following excitation of the margin of the anus. It is normally constant.

I do not here mention the other cutaneous reflexes, for of them I could say nothing of interest from the point of view that occupies us here.

Various affections are capable of causing abolition of the reflexes just enumerated.

Can these reflexes become exaggerated?* This is a complex question to which it is impossible to reply in a general way. We must consider separately, on the one hand, the abdominal reflexes, the reflex contraction of the fascia lata, and the reflex movement of flexion of the toes, and, on the other hand, the reflex movements of flexion of the foot, of the leg, and of the thigh.

As for the first group of reflexes, which for the nonce I unite in an artificial way, I cannot make a definite statement. To be sure, and I have already so asserted, their intensity is variable. They are sometimes extremely strong and lively, but I cannot affirm that under some pathological influence they may attain a degree that passes beyond the normal state.

For the second group it is quite different. In certain affections of the central nervous system, the reflex movements of flexion [dorsal] of the foot, of the leg, and of the thigh are manifestly exaggerated.

The reflexes of this second group deserve a special name; they have been called 'cutaneous reflexes of defense,' or simply 'reflexes of defense,' terms that have been used by physiologists to designate the reflex movements observed in animals, and which are especially intense in the lower extremities after transverse section of the dorsal cord.**

How can we recognize exaggeration of the reflexes of defense?

There are three principal characters which permit recognition of it: the amplitude of the movements is greater, the duration of the contraction is longer, and the reflexogenous zone is more extensive.

*[In reference to this question, the translator calls attention to the skin reflex called the wrist-sign, first described by him (A New Reflex Phenomenon in the Hand: The Wrist-Sign (*Interstate Med. Journ.*, Vol. XIX, No. 2, 1912). Normally, when the skin, at the outer border of the palmaris longus tendon on the wrist and near the palm, is irritated by scratching with a pointed instrument, there occurs usually a slight dimpling of the outer surface of the hypothenar eminence. In certain organic diseases of the pyramidal tract, hemiplegia, for example, this normal reaction cannot be induced on the hemiplegic side, but on the unparalyzed side, in the place of the normal slight dimpling described, there occurs, to like irritation, flexion of the hand on the wrist, approximation of thenar and hypothenar eminences with some extension of fingers and flexion of them at the metacarpal joints (interosseal). This phenomenon appears to be an exaggeration of a cutaneous reflex, an explanation of which may possibly be found in disturbance of homolateral innervation.]

**In collaboration, I have published the following articles on the reflexes of defense:—

(a) On the Possibility of Determining the Level of the Lesion in Paraplegias of Spinal Origin, by Certain Disturbances of the Reflexes, by J. Babinski and J. Jarkowski (*Soc. de Neurologie de Paris*, May 12th, 1910).

(b) On the Localization of Lesions Compressing the Cord. On the Possibility of Determining Their Seat and Their Lower Limit by Means of the Reflexes of Defense, by J. Babinski and J. Jarkowski (*Communication faite à l'Académie de Méd.*, January 16th, 1912).

(c) On the Reflexes of Defense in Friedreich's Disease, by J. Babinski, Vincent, and J. Jarkowski (*Société de Neurologie de Paris*, March 7th, 1912).

The flexion [dorsal] of the foot, of the leg, and of the thigh is sometimes carried to the extreme degree.* In certain cases the muscular contraction is maintained ten, fifteen, or more seconds, especially if the excitation that has provoked the contraction is continued; and in this way it is possible sometimes to induce a kind of transitory contracture. As for the reflexogenous zone, which, in the normal state, is ordinarily confined to the sole of the foot, it includes the leg, the thigh, and often even spreads to the trunk. Besides, it is notable that usually these movements take place more slowly than in the normal state; in this respect they are comparable with the reflex movements of extension and of abduction of the toes. I should say, too, that in a pathological state the reflexes of defense may be induced not only by excitation of the skin, but also by means of traction or pressure on the deep parts.

If in typical cases exaggeration of the reflexes of defense is immediately noted, there are still other cases in which, at first view, the exaggeration is doubtful, for the line of demarcation between the physiological and the pathological states is not clearly defined. The following points will be of value in bringing to light this surreflectivity.

(a) The subject being seated and the feet resting on the floor, the skin of the thigh or of the leg is excited by a faradic current. When the reflexes of defense are exaggerated, usually the thigh is flexed on the trunk, while the foot is raised from the floor and is maintained for a time in this position. When, the attitude the same, a normal person is thus tested by the electric current, the foot usually remains on the floor; exceptionally, however, flexion of the thigh is observed, but then the impression is given that it is not a reflex phenomenon, for this flexion is a part of a series of movements that are clearly voluntary.

(b) The subject being seated or lying, the skin of the dorsum of the foot, or of the lower part of the leg, is pinched. This causes the foot to flex [dorsally] sometimes very energetically, a result never observed in a physiological state. This manœuvre is perhaps the simplest to reveal a slight exaggeration of the reflexes of defense.

(c) With the subject lying, the extremity of the foot is seized by the hand and the toes forcibly flexed. This manœuvre, in case of surrefectivity, usually induces very marked flexion of the thigh, of the leg, and [dorsal] of the foot (Bechterew, Marie and Foix). In truth, in this case we have not to do with a cutaneous reflex, but the reactions obtained do not differ from those that may be obtained by excitation of the integument.

*In certain attitudes, excitation of the skin of the thigh or trunk may cause a movement of extension in place of a movement of flexion. I merely note the fact.

I must add that the degree of intensity of the reflexes of defense, with respect of its results, are of great importance, as will be seen later.*

So far I have limited myself to the discussion of the reflexes of defense of the lower extremities; they are by far the most common. But it should be noted that similar reflexes may be observed in the upper extremities.

With the foregoing facts established, we are in a position to consider the association that we have in view.

In what condition do we find the cutaneous reflexes in cases of pure lesions of the arcs of the tendon reflexes which cause tendon irreflexivity, as in peripheral neuritis or in tabes? Often they are equally abolished, or, they may be and often are present. In tabetics, in whom all the tendon reflexes are wanting, it is not rare to find present the abdominal and plantar reflexes; as for the anal reflex, specially studied by Rossolimo, its absence is much more frequent. But in this class of facts, the comparison of these two kinds of reflexes does not seem to possess much interest. On the contrary, the comparison should serve to fix attention in cases of lesions causing surreflexivity of tendons. Take, for example, a patient having a paraplegia due to a spinal affection implicating the pyramidal tracts, seated near the middle of the dorsal cord, causing exaggera-

*Concerning the mechanism of the reflexes of defense, Marie and Foix have put forth a theory which I can here discuss (see Les réflexes d'automatisme médullaire, *Revue Neurologique*, No. 10, 1912). They consider them allied to the complex act of walking, and call them "reflexes of medullary [spinal] automatism." Van Woerkom (see Sur la signification physiologique des réflexes cutanés des membres inférieurs, *Revue Neurologique*, No. 7, 1912) criticizes this idea, and maintains that these reflexes differ essentially from the alternate movements of the "stepping reflex," which are rhythmical, and he places them with the "flexion reflex" of the English physiologists. But he regards the expression "reflex of defense," which might well be applied to the "scratch-reflex" (effort to remove the cause of a pain by movements of active defense, as in the case of the frog that tries to wipe off the acid placed on its leg), as inappropriate for the reflexes we have under consideration; he calls them "movements of local escape" as opposed to "movements of general escape" in the "stepping reflex." However, this is of small import; it is merely an affair of convention. Van Woerkom, with Marie and Foix, unites, with the reflexes in question, the extensor reflex of the great toe. From the clinical standpoint, I think it is preferable to dissociate these two phenomena. In fact, in the normal adult, the reflex movements of flexion [dorsal] of the foot, of the leg, and of the thigh, are associated with flexion of the toes, and in the pathological state, as Van Woerkom himself acknowledges, the relation of the sign of the great toe to the "flexor reflex" is not indissoluble. I have even shown (Modifications of the Cutaneous Reflexes Under the Influence of Compression Induced by an Esmarch Bandage, *Revue Neurologique*, Vol. II, p. 951, 1911) in subjects affected with paralysis with contracture due to lesion of the pyramidal system, and presenting the toe-phenomenon, that compression of the leg with an Esmarch bandage may simultaneously exaggerate the reflex flexion [dorsal] of the foot, of the leg, and of the thigh, and cause the toe-phenomenon to disappear. Déjerine and Lévy-Valensi (*Revue Neurologique*, 2nd Semestre, p. 141) have published an observation of a patient having a traumatic lesion of the cervical region of the vertebral column which had caused complete solution of continuity of the cord. In this patient the reflexes of defense were exaggerated, while the cutaneous plantar reflex remained normal—of flexor type. This fact is another argument in favor of the distinction that should be made between these two kinds of reflexes.

tion of the tendon reflexes of the lower limbs. Very commonly, in such cases, the cutaneous reflexes present the following modifications: The abdominal and cremasteric reflexes are abolished; the reflex movement of flexion of the toes is replaced by extension associated with abduction; the reflexes of defense are exaggerated; and as for the anal reflex, it is generally present.

In organic hemiplegia, on the paralyzed side, we may find modifications of the same order.

Rosenbach was the first to note unilateral abolition of the abdominal reflexes in hemiplegics, and was struck by the contrast of this condition with the exaggeration of the tendon reflexes. Van Gehuchten, utilizing this fact, sought to place in apposition, in a general way, the tendon to the cutaneous reflexes; the exaggeration of the first was said to coincide with abolition of the second, at least of such [skin reflexes] as depend, according to him, on "long cerebro-medullary paths;" that is, the abdominal reflexes, the cremasteric reflexes, the gluteal reflexes, and the reflex of flexion of the toes, which is usually replaced by extension. This conception, though interesting, is not beyond criticism. Facts are known which are not in accord with it: (1) In certain cases of lesion of the pyramidal path with tendon surreflexivity, it is possible to obtain alternately extension and flexion of the great toe, by alternate excitation of the outer and inner border of the sole of the foot; (2) in an article published in 1904,* in which I studied the disturbances of the skin reflexes in affections of the pyramidal system, I called attention to the fact that in some patients, while excitation of the sole caused extension of the toes, the toes flexed very clearly when the skin of the upper part of the thigh or of the lower part of the abdomen was irritated; (3) some experiments of Ozorio de Almeida,** confirmed by me, show that in some persons presenting the toe-sign, compression of the lower limb with an elastic bandage may bring about transitory reappearance of the reflex of flexion of the toes. These various observations show that, with regard to the relations of the tendon reflexes and the reflex of flexion of the toes, the antagonism, which Van Gehuchten wished to establish, is not satisfactorily founded, and that his conception, if it contains some truth, cannot be admitted in its entirety.

In this relation I recall that in the report of a case by Déjerine and Lévy-Valensi, of complete solution of continuity of the cervical cord, the plantar reflex was normal; this fact is contrary to the hypothesis of Van Gehuchten, according to which this reflex is of 'cortical origin.'

Among the facts I have previously cited, there is one which to

*Sur la transformation du régime des réflexes cutanés dans les affections du système pyramidal (*Revue neurologique*, 1904).

***Brazil médical*, October 15th, 1910.

me appears worthy of special attention. It is the frequent association, in affections implicating the pyramidal system, of three phenomena: exaggeration of the tendon reflexes, the toe-sign, exaggeration of the reflexes of defense. But in what measure are the last two related to the first? I shall now try to answer this question, by-examining the relations of tendon reflectivity with the toe-sign first, and with the reflexes of defense.

In the great majority of cases of tendon surreffectivity, especially when this shows in ankle-clonus, the toe phenomenon is present; the toes, especially the great toe, extend in response to excitation of the sole, and sometimes, at the same time, they separate (fan-sign).

This rule has some exceptions. We have seen that articular lesions may engender tendon surreffectivity and ankle-clonus, when there is arthritis of the medio- or tibio-tarsus. But in cases of this kind the cutaneous plantar reflex remains normal, unless to the peripheral affection pyramidal trouble is added, as was the fact, no doubt, in the cases of chronic rheumatism with the toe-sign, reported by Léri.

I have already had occasion to state that sometimes, in organic hemiplegia with true exaggeration of the tendon reflexes, plantar excitation is followed by flexion of the toes.

Inversely, instances in which the toe-sign is found while the tendon reflexes are normal, are much more common. I would recall that in cerebral hemiplegia due to a focal lesion implicating the pyramidal path, or in paraplegia due to an acute myelitis or to a hemorrhage, the tendon surreffectivity only appears at a longer or shorter interval. On the contrary, the toe-sign manifests itself at once; I have seen it a few moments after the stroke.

In paraplegias due to sclerotic lesions of the cord, it is not unusual to find the toe-sign at a time when the tendon reflexes are about normal and ankle-clonus is wanting.

As is well known, generally the tendon reflexes finish by disappearing when two causes, one tending to induce surreffectivity, the other irreflectivity, enter into conflict. However, in such a case, the toe phenomenon is ordinarily present and testifies to a lesion of the pyramidal tracts. This is particularly seen in hemiplegia associated with tabes, in Friedreich's disease, and in other varieties of combined sclerosis.

Let me now bring together tendon surreffectivity and the reflexes of defense.

In cases in which the spinal lesions occupy the pyramidal tracts, as for example in common hemiplegia, in Erb's type of paraplegia, while the surreffectivity is always present and sometimes very marked, the reflexes of defense are usually only slightly exaggerated, and they may even be normal.

On the contrary, in diffuse spinal sclerosis, in compression of

the cord by a tumor, in pachymeningitis, in Pott's disease, often the reflexes of defense become extremely exaggerated, as my observations have shown. In cases of this kind, there is also often tendon surreflexivity, but not constantly; and one may observe these very reflexes of defense associated with normal, feeble, or abolished tendon reflexes. I shall return to this point when I consider contracture in its relations with the tendon reflexes.

Finally, place parallel simultaneously the three phenomena in question. The divers modes in which they may be associated or dissociated have a clinical significance which, it seems to me, is interesting to point out. In the following table (II) are, in résumé, the facts known relative to this subject, which, however, is not exhausted, which demands new investigations, and concerning which I do not pretend to make statements that may not call for revision. I wish especially to make clear the interest there is in making a systematic comparative study of these three kinds of reflexes.

TABLE II.

Tendon Reflexes	Toe Phenomenon	Reflexes of Defense	Clinical Significance
Exaggerated	Present	Slightly exaggerated or normal	Pure lesion of the pyramidal tract; for example, spastic paralysis of Erb, or hemiplegia with secondary degeneration.
Exaggerated	Absent	Slightly exaggerated or normal	Same meaning as above, or a peripheral lesion (arthritis).
Exaggerated	Present	Much exaggerated	Compression of the pyramidal tract; for example, tumor in spinal canal, pachymeningitis, Pott's disease, or diffuse patch of sclerosis.
Feeble or abolished	Present	Much exaggerated	Same meaning as just above; besides probability of lesion of the tendon reflex arcs. This manner of association seems especially related to diffuse sclerotic lesions of the cord.
Feeble or abolished	Present	Much exaggerated and very lively	This is the association found in Friedreich's disease by Jarkowski, Vincent, and myself.
Feeble or abolished	Present	Slightly exaggerated or normal	Lesion of pyramidal tract associated with tabes.

(TO BE CONCLUDED.)

MEDICAL AND SURGICAL PROGRESS.

ANTERIOR POLIOMYELITIS.

A REVIEW OF THE RECENT LITERATURE IN REGARD TO THE EPIDEMIOLOGY, ETIOLOGY, MODES OF TRANSMISSION, BACTERIOLOGY AND PATHOLOGY. ITS CLINICAL MANIFESTATIONS AND ITS TREATMENT.

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SECTION II.

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144. Amoss: A Note on the Etiology of Epidemic Poliomyelitis. (*Journ. Exper. Med.*, Vol. XIX, No. 2, February 1st, 1914.)
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In the study of the etiology, modes of transmission, bacteriology and pathology of anterior poliomyelitis there are many points of interest which have been worked up to a fairly final stage and have given us certain definite facts to use in dealing with this disease. A review of the great amount of literature which has been rapidly accumulating during the past seven years, beginning with the studies of Harbitz and Scheel in Norway in 1907, has been undertaken. In this section I will take up each paper of interest and value which has been published since then, so as to offer to the reader a general survey of the field so far covered, which will give him an adequate idea of the subject from these various points of view, and also an idea as to the great amount and value of the research work which has been done in the hope of finding a definite answer to the various so far unsolved problems to be met with in this increasingly prevalent disease.

Harbitz and Scheel (79), in an anatomical investigation of the nervous system of 19 cases of acute poliomyelitis, found in the spinal cord a diffuse infiltrating inflammatory process closely related to the blood-vessels and chiefly in the gray matter, and within this, chiefly in the anterior horn. Generally the inflammation extended along the whole length of the cord, but was most intense in the cervical and lumbar enlargements. The degeneration of the ganglion cells was generally very marked, and extended rapidly over large areas of the cord. There were numerous 'heaps' of leucocytes corresponding to destroyed ganglion cells. It was remarked that the inflammation was generally more than was to be expected from the clinical symptoms, and often took on a hemorrhagic character. Microscopic evidences tended to show that the pia mater was involved first and that the inflammation then extended to the cerebrospinal fluid and the cord. The inflammation reached its greatest inten-

sity in the anterior gray horns, because they are supplied by the most numerous and largest blood-vessels. The symptoms of meningeal irritation seen early in many cases also tend to show that the meninges are involved first. They also found more or less extensive inflammation in the brain substance, most pronounced, however, in the medulla oblongata and pons. They speak of Geirsvold as having found a diplococcus in the spinal fluid in 12 cases. He inoculated animals with the germ and produced paralysis and death. Up to this time this diplococcus had been accepted as the causative agent in this disease.

Harbitz and Scheel (90) speak of certain micrococci which they found in 3 of the cases they had previously reported (79). These bacteria were demonstrated in the spinal fluid, and proved to be bean-shaped diplococci, which grew in from two to six days on artificial cultures. They speak of a number of other men who have found similar diplococci in other cases of poliomyelitis. The cocci proved virulent for animals in that they caused atrophy, paralysis, emaciation and death.

Pasteur, Foulerton and MacCormac (138) report a case of non-fatal acute poliomyelitis in which they were able to identify in the spinal fluid, withdrawn during life, a micrococcus which produced on injection, into a series of rabbits, symptoms resembling the disease in human subjects. The same micrococcus was identified in the spinal fluid of the experimental animal, although they were unable to produce it by culture.

Landsteiner and Popper (91) claim that they have transmitted the disease to monkeys. They seem to have been the first to have attempted to communicate the disease to animals by direct inoculation. They used parts of a spinal cord of a boy who died of poliomyelitis; the inoculations of this material emulsified in salt solution being made into the peritoneal cavity of monkeys, rabbits, guinea-pigs and mice. Only two of the monkeys showed any effects of the inoculation, one becoming severely ill on the sixth day and dying two days later, and the other becoming completely paralyzed in the hind legs about seventeen days after the inoculation. Pathologically, both these animals showed the typical lesions of poliomyelitis. They were unable, however, to propagate the disease experimentally beyond the first generation, and they suggested that the virus of poliomyelitis probably is not demonstrable by the usual methods used to study bacteria, but might be a virus of protozoon nature.

Flexner and Lewis (92) tried to transmit the disease to lower animals first in 1907, at which time cerebrospinal fluid, obtained by lumbar puncture, was introduced into the spinal canal and peritoneal cavity in monkeys and other animals. Their results were negative. In 1909 they introduced, through a trephine opening in the skull of monkeys, portions of a spinal cord from a case of poliomyelitis six hours after death of the patient. The injected material consisted at first of emulsions in salt solution of the spinal cord from the children, and later of emulsions of the spinal cord of monkeys who developed paralysis. By this means, they proved that the disease could be transmitted through an indefinite number of monkeys. A delayed or unsuccessful inoculation could be converted into a successful one by reinoculation with an active virus. They state that since poliomyelitis has long been supposed to be an infectious disease, and that its successive transfer by an active agent

has been accomplished, any further doubt as to its infectious origin can hardly longer be maintained.

Robertson (46) reports the pathological findings in 3 fatal cases in the Minnesota epidemic of 1908, and states that microscopically the lesions in every case have resembled each other—namely, congestion of the vessels, especially those leading to the anterior horns, perivascular infiltration of polymorphonuclear and mononuclear cells, infiltration of pia and nerves running from the anterior horns, necrosis of the gray matter of the anterior horns, especially the ganglion cells, with diffuse infiltration of polymorphonuclear and mononuclear cells, hemorrhages into the gray matter of the anterior horns, thrombosis of vessels in region of hemorrhages, dilated lymph channels, and occasional infiltration along the lines of vessels extending to base of brain and also posterior horns of the cord.

Flexner and Lewis (93), in a second article dealing with the nature of the virus of epidemic poliomyelitis, conclude that in view of the negative result of bacteriological and histological examinations, the infecting agent in this disease belongs to the class of the minute and filterable viruses which so far have not been demonstrated with certainty by the microscope. They also state that the virus of poliomyelitis can be transferred to the central nervous system by way of the subcutaneous tissues in monkeys, and also that the two viruses, one from each monkey, have each been passed through six series of animals.

In another paper Flexner and Lewis (94) point out how they succeeded in detecting the virus of poliomyelitis in the nasal and pharyngeal mucosa of the monkey, from which they concluded that one path of elimination of the virus was by way of the nasal mucosa through its lymphatic connection with the pia and arachnoid of the brain. They showed by experiment that by inoculating a monkey through a scarified nasal and pharyngeal mucosa, infection resulted. They also proved by experiment that the virus of poliomyelitis was contained not only in the central nervous system, but in the mesenteric lymph-glands, which suggests that it may be present also in other organs in human subjects of the disease.

Flexner and Lewis (95) in a further contribution show that the spinal fluid withdrawn on the third day, which is several days in advance of the appearance of the paralysis, contains the virus, and when injected intracerebrally may set up a paralysis in another monkey. They state that the virus is quickly destroyed by a dilution of perhydrol containing 1 per cent. of hydrogen peroxide.

Weinicke (96) reports his experimental findings following an investigation with monkeys and rabbits. He found that the incubation period was usually from eight to fourteen days, but varied from three to forty-one. In using an attenuated virus, a considerable percentage of the inoculated animals remained well instead of dying, and the incubation period was lengthened. In a second paper (98) it is stated that the virus in man and infected animals is found not only in the central nervous system, but also in the blood and parenchymatous organs, and is also found in cadavers.

Levaditi (99) observed the constant presence of a great number of extremely minute corpuscles stained deep red by Loeffler's method, following the incubation of an active Berkefeld filtrate in bouillon for fifteen days. Monkeys inoculated by this filtrate, following incubation, became paralyzed.

Landsteiner and Levaditi (100) undertook some experiments to determine the transmissibility of the disease in a series from monkey to monkey. They were able to infect a chimpanzee by injecting 5 c.cm. of an emulsion of the cord of a baby, which had died of the disease, into its peritoneal cavity. Following the death of the chimpanzee, they were able to transmit the disease to monkeys by injecting an emulsion of the chimpanzee's cord into their peritoneal cavity and brains. The period of incubation from injections to first symptoms is from seven to eleven days, the longest period twenty days. The incubation period is prolonged by the use of small amounts of the virus. The pathological lesions were the same as those found in human cases. They feel that the toxins act directly on the nerve cells, and that the degeneration of the neurons is not dependent on vascular lesions. The microbe invades the nervous system through the perivascular lymph spaces, and when it reaches the gray matter attacks the nerve cells. They also state that emulsion taken from animals more than a few days after the acute stage of the disease does not carry the infective agent. One attack produces immunity in animals, and the serum of cured animals has destructive powers over the virus of the disease which is most suggestive.

Strauss (101) tried in 10 cases to inoculate monkeys with infantile paralysis by injecting the filtrate of nasal swabbings from patients ill with the disease. He was wholly unsuccessful.

Knopfmacher (102) attempted to carry over to a second generation the disease with which he had inoculated a monkey by the peritoneal route, by means of the spinal cord of a child which had died of poliomyelitis. He was unsuccessful.

Leiner and Weisner (103) conducted a research on acute poliomyelitis, and state that the intracranial method of inoculation in apes offers more reliable results than the intraperitoneal method. The various micro-organisms, which have been described by various authors in the past as the cause of the disease, could not be identified, and they consider that they must be looked upon as accidental findings.

This view has been concurred in by Duval (104), of New Orleans, who states that there is a complete absence of "uniformity in the bacteriological examinations of the spinal fluid in cases of poliomyelitis thus far recorded, and the results are without the slightest value." In connection with this statement, we may turn to the paper of Strauss and Huntoon (105) based on the careful experimental investigation of one fatal case. Cultures from the cord in this case on agar showed a bacillus, which injected intraperitoneally into a monkey produced acute poliomyelitis, but this disease could not be transferred to other monkeys. The authors think that the cerebrospinal fluid does not contain the virus in an infective state, and that the bacterial findings in this fluid are either contaminations or secondary invaders.

Krause and Meinicke (106) made examinations from the blood, spinal fluid, tonsils, stools and urines of living cases. Cultural experiments and injections into animals failed to reveal the specific cause of the disease. They were able, however, to infect rabbits by the intra-peritoneal route, which after long periods of good health, showed changes in the nervous system and died.

Russel (107) thinks that the disease is a general infection which

affects more particularly the spinal nervous system and meninges and not alone the gray matter supplied by the anterior spinal artery. He thinks that we get sensory changes as well, which are not detected, because we generally are dealing with children in whom the testing of sensibility, when only a relative impairment is expected, is impossible.

Flexner and Lewis (108) note that the disease can be transmitted readily from monkey to monkey by using the intracerebral route, possibly through an indefinite series, and also that it is possible to transmit the disease successively by means of inoculating the sciatic nerve, the circulation, the peritoneum and subcuticular tissues.

They also have shown that the virus was filterable through a Berkefeld filter and withstood glycerination. They have produced the disease by injecting an emulsion of regional glands, which communicated with a nodule caused by a subcutaneous injection of the virus. In regard to the resistance of the virus they state that the spinal cord from a human case retained its virulence after being kept frozen at 2° to 4° C. for forty days. They state that these experiments have a distinct bearing on the epidemiology of the disease and indicate that the cessation of the cases which occurs with the onset of cold weather does not depend on the destruction of the virus. Experimental evidence tends to show that an attack of poliomyelitis affords immunity to reinfection.

Lucas (109) has examined the blood of monkeys before and after inoculation, and found that in the acute stages of the disease there was a moderate to a constant lymphocytosis and an eosinophilia. Parallel with this lymphocytosis there was a marked and constant leukopenia. This drop in the white count lasted fairly consistently with the acute state, disappearing about the time that the hyperesthesia or other manifestations of the acute stage disappeared. The count did not change during the incubation period, but did drop occasionally during the prodromal stage.

The spinal fluid also showed even more marked characteristics during the various stages. Before inoculation a dry tap was the rule. During incubation there was a marked increase in the spinal fluid, and the cells were markedly increased. These cells were mainly the large mononuclear type. In the prodromal stage there is even a more marked increase in these same cells.

In this prodromal stage polynuclears are still present as high even as 60 per cent. In the early acute stage the increase is very marked, but cells of the lymphocytic variety predominate. As the cells decrease in number the polynuclears begin to return, and at the end of a week or ten days there are very few cells present. In an examination of the spinal fluid of four children suffering from the disease, similar findings were observed.

Gay and Lucas (110) also tested the serum of inoculated monkeys for antibodies unsuccessfully, and also had negative findings for antigens in the spinal fluids of monkeys and human beings at various stages of the disease.

Flexner and Lewis (112), in a note on the mode of spontaneous infection, state that the experimental results show that a path of elimination of the virus of poliomyelitis is by way of the nasopharyngeal mucosa, and that the infection may also traverse the same path. They believe, therefore, that it is desirable to destroy the secretions of the nasal and buccal cavities as a matter of pro-

phylaxis. They state that Levaditi and Landsteiner (100) found that the salivary glands contained the virus.

Rosenau (67) reports to the Massachusetts State Board of Health his attempts to transmit the disease to monkeys by inoculation with the nasal, pharyngeal and buccal secretions of 18 human cases. He reports in detail the method of collecting the material by washing the nose and throat with salt solution, and also the detail of each case with the report of the inoculated monkey. He was unsuccessful in producing paralysis in any of the monkeys, and believes that some of the factors in the failure were possible attenuation of the virus and dilution of the virus from such large amounts of salt solution as were necessary to collect the material.

Skoog (113) reports the results of some of his experiments for the Kansas State Board of Health, at the University of Kansas. A number of animals in the autumn of 1909 were used, including chickens, guinea-pigs, rabbits, and three monkeys. Cerebrospinal fluid and blood from infected cases were introduced into these animals, all intraperitoneally, excepting for one intraspinal injection in a monkey. The results were all negative. In the summer of 1910, he experimented with some other monkeys and was able to produce the disease by inoculation from human and monkey virus, in two monkeys, by using the intracranial route. Other inoculations failed.

Osgood and Lucas (114) report a most interesting and suggestive series of transmission experiments, having used the nasopharyngeal mucosa of monkeys, recovered from the acute stage of poliomyelitis, for purposes of inoculation.

Beginning with a well monkey, they inoculated it with an active virus intracranially. He became completely paralyzed in nine days, and died five months later. The nasopharyngeal mucous membrane was removed, ground up in sterile salt solution, and passed through a Berkefeld filter. Monkey No. 2 was now injected intracerebrally with 7 c.cm. of this filtrate. He died in five days showing prodromal symptoms of the disease, and an autopsy showed the characteristic lesions of poliomyelitis. 2 c.cm. of the same filtrate were injected in the same way into monkey No. 3, but he failed to show any symptoms and remained well. Monkey No. 4 received, by the intracerebral route, 6 c.cm. of the emulsified cord and brain of monkey No. 2 which had died with paralysis. It became paralyzed in seven days, and was sacrificed, the autopsy showing a typical poliomyelitis. Monkey No. 5 was given 6 c.cm. of the emulsion from the cord of monkey No. 4. It became paralyzed in four days and was killed. The autopsy showed typical lesions. No. 6 was given 5 c.cm. of the filtrate of the cord of No. 1 which had been preserved in equal parts of glycerin and salt solution, but it developed no symptoms.

No. 7 was given 2 c.cm. of a 5 per cent. emulsion in salt solution which had been obtained from Dr. Flexner. Paralysis appeared in eleven days. It was killed about five weeks later and the nasopharyngeal mucosa was obtained, ground up and passed through a Berkefeld filter, and 10 c.cm. of this was injected into monkey No. 8, which died two days later of respiratory failure. The nasopharyngeal mucosa was obtained and treated in the usual way, and 7 c.cm. were injected into monkey No. 9, which developed paralysis two weeks later and died the next day of respiratory failure, showing typical lesions of poliomyelitis. No. 10 was given 5 c.cm. of the filtrate from the cord of monkey No. 8, and in two

days there was complete paralysis, the autopsy showing the usual lesions.

Their experiments showed that they were able to transmit from monkey to monkey a typical poliomyelitis from the filtrate of the nasopharyngeal mucosa of two monkeys six weeks and five and one-half months respectively, after the acute stage of the disease had passed. They also found it impossible to transmit the disease by intracerebral inoculations of the cord and brain of these recovered subjects, or from the filtrates of the nasopharyngeal mucosa of a monkey in good health, which had received a previous intracerebral inoculation of an active virus, and which had lived in close contact with monkeys in the acute stage of the disease. Their observations show that the virus can persist in a viable and infectious state in the nasopharyngeal mucous membrane in the monkey for several months after the acute period of paralysis has passed and for a far greater time than it survives in the central nervous system.

Anderson and Frost (115) examined blood specimens from a number of abortive cases of poliomyelitis, and inoculated monkeys with equal parts of the blood-serum and active virus. They believe from their results that the normal human serum may have a germicidal action on the virus of poliomyelitis. No difference was shown between the normal serum of adults and of children in regard to their action on the virus. The serum of patients, who have had the disease and recovered, exhibits a germicidal action on the virus considerably greater than that exhibited by normal serum.

Neustaedter and Thro (116) collected the dust of rooms wherein cases of poliomyelitis had occurred, and prepared extracts from these sweepings, which they injected subcutaneously, intraspinally and intracerebrally into monkeys. The sweepings were obtained from cases of from six months' to three days' duration after the onset of the paralysis. They succeeded in producing paralysis in a monkey, by an intraspinal injection, by using the sweepings of a room which had been occupied by a child with acute infantile paralysis for two days. The dust was macerated overnight with sterile water and then filtered through paper and then through a special Bongé filter. This filtrate was then injected with the above result. The paralysis occurred six days after the injection. The autopsy on the monkey showed typical lesions of poliomyelitis. The authors believe that they have proved that acute poliomyelitis is both infectious and contagious; that it is propagated by dust, and that the nasopharynx must be the port of entry.

Flexner and Clark (118), in their eleventh note, state that the virus has been found to be present in the tonsils, in that they were able to produce the disease experimentally in monkeys, by injecting emulsions intracerebrally and intraperitoneally. They state that the virus has not been found in the blood of human beings, and that it has been found in the blood of the monkeys at the height of the disease only when large quantities are withdrawn and injected intravenously into a healthy monkey. The cerebrospinal fluid fails to show the virus at the onset of the paralysis in human beings and monkeys. It has been detected, however, in the spinal fluid of monkeys three or four days after an intracerebral injection and during the incubation stage. They state that the human strain of the virus not only infects monkeys less readily than do the modified

or monkey strains, but the experimental disease produced by them is less severe and less fatal.

Lucas and Osgood (119) carried out a series of experiments, in order to determine the protective value of certain specific sera and vaccines against the virus of poliomyelitis, for the Massachusetts State Board of Health in 1911. They concluded that in the monkey a partial and perhaps complete immunity to the infection of dysentery, streptococcus pyogenes, typhoid fever, gonorrhea, pertussis, and staphylococcus pyogenes affords no demonstrable protection against the virus of poliomyelitis. They state that Landsteiner and Levaditi (*Annales de l'Institut Pasteur*, November, 1911) found that specific inoculations carried out with the virus of rabies—a disease much more closely allied to poliomyelitis than any of the infections above detailed—produced in monkeys no immunizing effects whatever.

Pettersson (120) states that large amounts of the virus of poliomyelitis were found by him in secretions from the mucous membrane of the nose, pharynx, trachea and intestines. He was able to demonstrate the presence of the virus by inoculating monkeys. He stated also that there is nothing against the hypothesis that epidemics are spread by direct or indirect transmission of the virus from person to person. However, there is a good deal against the supposition of the transmission of the virus by insects to such a degree as to cause epidemics.

Flexner, Clark and Dochez (121) experimented on a monkey for the purpose of determining the viability of the virus of poliomyelitis in the stomach and intestines, and concluded that since the virus occurs in the nasal and buccal mucus in humans, it is inevitably swallowed. The virus survives the action of the gastric juice and intestinal secretions, and persists for a time in these organs. In human beings it leaves the body in part with the intestinal discharges, which are consequently potential sources of infection.

Rosenau and Brues (122) exposed monkeys in all stages of the disease to the bites of *Stomoxys Calcitrans*, or stable fly. The monkeys had been infected in the usual way by injections. After the flies had had ample opportunity to bite these infected monkeys during the various stages of the disease, including the inoculation period, healthy monkeys were then exposed to the bites of these same flies. Out of twelve healthy monkeys, six had indications of the disease, three in virulent form resulting in death, and three with partial paralysis, but recovered. No conclusions are drawn as to the significance of these experiments.

Flexner (123) recapitulates in regard to the present knowledge of the disease. He states besides that the virus has not been found as yet in the spleen, kidneys, liver, or bone-marrow. He states that it escapes from the body by the nose, throat and intestines. He states that it has been established that the virus passes readily from the intact, or practically intact, mucous membrane of the nose to the central nervous system, and that this membrane, next to the direct intracerebral introduction of the virus, provides the readiest method of successful inoculation. He believes that the clinical evidence is strong in suggesting that human carriers of the poliomyelitis virus exist. The virus has been detected in the secretions of the nose, throat and intestines of persons suffering from abortive ambulant attacks of poliomyelitis. The unrecognized cases of

abortive poliomyelitis play a highly important part in the dissemination of the virus through which the area of infection is extended.

A similar part has been accorded by clinical observation to the healthy virus carrier. House flies may act as passive contaminators, since the virus survives in these insects. Bedbugs have been infected with the virus, which remained alive in these insects for many days. A filtrate prepared from these bedbugs and injected into monkeys caused them to develop the characteristic paralysis. He believes that the extension of the disease is limited by a high, natural indisposition or insusceptibility to infection existing among persons of all ages.

Anderson and Frost (124) exposed three monkeys daily to the bites of several hundred *Stomoxys*, which at the same time were allowed daily to bite two inoculated monkeys. These first three monkeys developed typical poliomyelitis eight, seven and nine days respectively from the date of their first exposure. In order to confirm the diagnosis of poliomyelitis in these monkeys, 1 c.cm. of an emulsion of the cord from one of them was injected intracerebrally into a healthy monkey, which on the third day following developed a partial paralysis of the foreleg. The next day the animal became completely paralyzed and died. At autopsy, histological examination showed the characteristic lesions of poliomyelitis, intense congestion and perivascular infiltration, foci of round cell infiltration here and there in the gray matter, destruction of the cells of the anterior cornu, and small hemorrhages in the anterior and posterior cornua.

One point of special interest in the results reported by Anderson and Frost is the period elapsing between the first exposure to flies of the infected animal and the development of the disease in the healthy monkeys, the shortest period being seven days, which is shorter than that found by Rosenau in his experiments (122).

Langhorst (125) states that dogs are numerous in the countries that have suffered most with poliomyelitis; dogs are also more numerous in the country districts where the disease is most prevalent. He reports 2 cases in detail, one of a man of thirty-five who died of the disease two or three weeks after he had cared for his dog which had paralysis of the hind legs, and which had licked his hand over an abraded area. He believes that the dog could have inoculated his master with the secretions from his nose and throat. The second case was in a boy of six who developed paralysis about three weeks after having been bitten by a pet dog.

Howard and Clark (126) claim that the domestic fly (*Musca domestica*) can carry the virus of poliomyelitis in an active state for several days on the surface of the body, and for several hours in the intestinal tract. Mosquitoes have not, in their experiments, taken up and maintained in a living state the virus from the spinal cord of infected monkeys. Lice have also failed to do so. The bedbug has, however, maintained the virus in an active state for seven days. House flies cannot be viewed as actual inoculators of the virus, however, since these insects do not bite, but as their power of flight is great, they therefore must be considered as potential passive contaminators, theoretically capable of carrying and depositing the virus at a considerable distance from the original point of infection. Through the ordinary active habits of the fly, the virus

may be transferred to persons or things with which persons come in close relation, and by their death the flies may through disintegration liberate surviving virus that may become dust.

Flexner, Clark and Fraser (127) describe an instance of the demonstration of the virus of poliomyelitis on the upper respiratory mucous membranes of healthy human adults, the parents of a child suffering from an acute attack of epidemic poliomyelitis. The patient was taken sick on October 12th, 1912, and developed paralysis October 17th. On October 28th, the mother and father were subjected to a nasopharyngeal irrigation of normal salt solution. This fluid was passed through a Berkefeld filter and injected into the sheath of each sciatic nerve and into the peritoneal cavity of a monkey. Paralysis developed in the monkey on November 12th, and the animal was killed the next day, the autopsy showing typical lesions of poliomyelitis. Emulsions of the glycerinated spinal cord of this monkey was injected into each sciatic nerve and into the peritoneal cavity of two monkeys. Six days later, one of the animals showed prodromal symptoms, and four days later was killed, the pathological examination showing the typical infiltrative lesions of poliomyelitis. The other monkey became paralyzed sixteen days after the inoculation, and four days later was almost wholly paralyzed and was killed. The autopsy showed the usual characteristic lesions. These experiments offer undoubted evidence of the occurrence of the virus of the disease in the nasopharynx of healthy persons, who have been in close contact with an acute case of poliomyelitis, and afford an experimental basis for the belief, based on clinical observations, of the occurrence of passive human carriers of the infection.

Flexner and Noguchi (128) note the results of their efforts to cultivate the virus of poliomyelitis, using the methods employed by Noguchi in the cultivation of spirochetes, and worked out by him. They state that the virus belongs to the class of filterable organisms, and passes readily through Berkefeld filters, and that up to the present it has not been rendered certainly visible.

The culture mediums consisted of sterile, unfiltered ascetic fluid, or of brain extract to which fragments of sterile rabbit kidney and a layer of paraffine oil have been added, and of these plus 2 per cent. nutrient agar-agar in proportions of one to two.

The first mediums permit of a slow growth not visible to the naked eye, while the second (which are unsuitable for obtaining the initial growth) yield, after several days, visible minute colonies clouding the tube. These cultivations are conducted under anaërobic conditions. The minute colonies are composed of globular or globoid bodies. These bodies appear in a variety of arrangements, single, double, short chains and masses. The cultivated bodies stain a pale reddish violet in Giemsa's solution, and bodies of identical appearance have been demonstrated by Noguchi, in films prepared directly from the nervous tissues. Cultures have been inoculated into monkeys and have caused the typical lesions of poliomyelitis, and from the nervous tissues of these monkeys other animals have been inoculated and the culture recovered in pure culture.

McIntosh and Turnbull (129) succeeded in infecting monkeys with poliomyelitis from 2 cases of sporadic disease. Both these strains have been transmitted through a series of monkeys. These are the first recorded successful transmissions of the disease from

man to monkeys in England, in which the virus has been obtained from English cases. The authors believed that their previous failure to infect monkeys was due to the fact that the infective agent is rather avirulent, as it is seen in England, where the disease is only slightly epidemic. The monkeys were inoculated intradurally as well as intraperitoneally with emulsions of the cord. The authors suggest that in sporadic cases the virus is feeble, and the occurrence of the disease is due to a hypersusceptibility of the individual attacked, while an epidemic only results when the virus has become exalted either by a series of passages through susceptible individuals, or from some other unknown cause.

Lucas and Osgood (130) report finding the virus of the disease in the nasal secretions of a human carrier four months after the acute stage of a second attack of poliomyelitis. They state that others have also found the virus in washings from the nasopharynx of parents, attendants, and friends, and also that the virus has been found as long as 204 days after the infection in the nasopharynx washings. They report the case of a boy who had an attack of poliomyelitis in February, 1910, and a second attack in September, 1912. In November, 1912, nasal washings were obtained with which two monkeys were inoculated with negative results. Later, January, 1913, more nasal washings were obtained and two monkeys were inoculated with negative results. This was repeated later in January, 1913, and the monkey became paralyzed and died, but the pathological findings were not typical but suggestive.

January 31st, 1913, the injection was repeated with a fresh nasal secretion, and the monkey died eight days later, completely paralyzed. Two monkeys were then inoculated, one with a cord emulsion of this last monkey and one with a cord emulsion of the monkey which died with atypical pathological findings, but which was paralyzed. Both these died with typical poliomyelitis, demonstrating the long period during which the virus was harbored in the nasopharynx; secondly, that his sister was infected two years after the original attack; and thirdly, the recovery of the virus from his nasal secretions four months after his second attack, and two years and three months after his first attack. Also that the successful inoculations were due to filtrates from straight nasal secretions, and not from washings.

Proescher (131) in a discussion as to the etiology of poliomyelitis and variola, states that the virus of poliomyelitis is constantly found in pure cultures in the central nervous system, and is seldom found in the large internal organs. It belongs to the easily filterable viruses, and passes through the Berkefeld filters V and N, Chamberland, Reichel and Pukall filters. He states that the virus of rabies, poliomyelitis and variola can be made visible with methylene azure carbonate, and that their invisibility is therefore not due to their submicroscopical size, but to their special staining properties. The size of these viruses averages the same. He believes that the term filterability does not mean microscopical invisibility, for other investigators have shown that the smallest visible forms of viruses are about 0.1 to 0.2 micron, which border on the line of microscopical visibility. This size corresponds to that of the smallest pores of the filter, through which the micro-organism can pass.

The poliomyelitis virus is the easiest filtered, through all kinds of filters. The variola and rabies virus is very difficult to filter,

especially the rabies virus, which will pass the Berkefeld filter only in small quantities. He states that the difference in the filterability of these viruses demonstrates clearly that not only the size, but also the individual differences in the chemical constitution of the protoplasmic substance play a rôle in the filterability. If the size alone controls the filterability, all these viruses should pass the same filters with the same ease as the poliomyelitis virus. He believes that the staining properties of these viruses may give a key to their chemical constitution, which will satisfactorily explain not only the cause of filtration, but their other peculiar biological properties.

Rosenau (132) in an address to the Massachusetts Medical Society in June, 1913, as to the mode of transmission of poliomyelitis, states that in spite of the large amount of research work done on this problem, the mode of transmission still remains unsolved. Of the two methods—epidemiological field studies and laboratory research—of approaching the problem, the epidemiological evidence is less to be trusted, for he states that sanitarians know well that it has always been necessary to revise the chapter on the epidemiology of a disease as soon as its mode of transference is discovered. The four chief theories of transmission are: (1) That it is a 'contagious' disease, communicated directly from person to person through the secretions from the mouth and nose; (2) that it is an insect borne disease; (3) that it is conveyed through dust; (4) that it is an alimentary infection, the virus being taken in with food and drink, and absorbed from the intestine.

He states that there is evidence both from field and laboratory to support each one of these theories. He then goes on to discuss these theories and the data which have been put forward in support of each, and which are covered in the previous review of literature in this paper. In concluding he states that in the present state of our knowledge, a definite answer cannot be made to these important queries, *i. e.*, as to its mode of transmission, and that we shall have to await further research before the health officer can combat infantile paralysis with any assurance of success.

Kling (140) reports that he found in a research on the virus and mode of transmission of infantile paralysis 78 per cent. of the monkeys contracted the disease after inoculation with water in which the organs and mucous membranes from poliomyelitis cadavers had been rinsed. The virus was found constantly in the secretions from the nose and throat and in the intestinal contents of patients sick with acute poliomyelitis, and also in those patients with light abortive cases of the disease, and further in numbers of healthy contacts. He states that the virus soon loses its virulence, so that isolation need not be kept up for more than two weeks, although the virus was found in the nasopharynx up to seven months in a few of the cases. He thinks that it is probable that each abortive case is surrounded by a number of carriers, but serious epidemics do not occur, as the persons exposed are not susceptible.

It seems to be the rule that a region, where the disease has been epidemic, is spared further inroads of the disease later, indicating perhaps that a large part of the population had become immunized by having had the disease in an attenuated form.

Kling, Wernstedt and Pettersson (133) report that in 9 cases of

infantile paralysis the secretions from the mouth and intestines were obtained by washings, and monkeys were inoculated with these washings at various intervals. Almost all the monkeys inoculated in the first few weeks died, and only one died after inoculation after seven months. In only one case were the secretions harmless as early as by the end of the first month. There was, however, a steady decrease in the degree of virulence as time elapsed. Inflammatory exudate in the spinal cord was found only in the monkeys inoculated in the first two or three weeks. After that the chief change noted was a degeneration of the nerve cells, which showed diminished virulence of the toxin. They state that it would be manifestly impossible to isolate patients for the several months during which the secretions might be infectious, but if they are isolated for the first few weeks of greatest virulence, the disease will appear only in the milder or abortive forms.

Haywood (141) reports a case in detail of a boy who two weeks previous to the onset of the disease had been bitten on the lip by a dog. Examination of the dog's brain showed the presence of the Negri bodies. Up to the time of the development of the poliomyelitis, the boy had received fifteen injections of the rabies serum. He developed an acute attack of poliomyelitis over night, involving arms, legs and bladder, from which he partially recovered eventually.

Sawyer and Herms (134) report the failure of their experiments to transmit the virus of poliomyelitis from monkeys suffering from poliomyelitis to healthy monkeys by means of the stable fly. They also failed to produce poliomyelitis in two monkeys inoculated intracerebrally with ground and filtered flies which had fed on the blood of a monkey sick with poliomyelitis. In one instance, the flies had just ingested the blood, and in the other they had bitten the infected monkey four and five days before. They also failed to transmit the disease through frequent alternate bitings of sick and well monkeys, followed by daily feedings on healthy monkeys. They were also unable to transfer the disease to well monkeys by flies which had bitten in rapid alternation well monkeys and a sick monkey painted with his own nasal washings, feces and saliva.

Poliomyelitis had not been produced in a well monkey by stable flies even when they had to drive their proboscides through a layer of highly infectious brain tissue in order to pierce the skin. The same flies did not transmit the disease on subsequent bitings of two other monkeys. These results differ markedly from those obtained by Rosenau and Brues (122) and by Anderson (124).

It is well known (135) that epidemic poliomyelitis does not attack all those who are exposed to the infection. In some cases the attack is so mild as to be recognized only with difficulty. What is the reason for this apparent variation in susceptibility? Kling and Levaditi have observed that the serum of patients who are in the midst of an attack, or who have passed through an attack, destroys or neutralizes the poliomyelitis virus (100). This has been demonstrated by injecting monkeys with suitable mixtures of virus and serum. Tests of this kind with the serum of children who appeared to be refractory to poliomyelitis, because they remained well while living in the midst of a heavily infected district, gave in 2 out of 9 cases complete protection, in 5, partial protection, and in 2, none at all. This condition may be supposed to be the result

of an acquired immunity due to a spontaneous protective vaccination or inoculation, in that the virus invading the upper respiratory passage multiplies sufficiently to produce a distinct antigenic effect, but no other appreciable reactions. In order to test the correctness of this theory, it would be necessary to repeat the experiments on the protective action of the serum, with the serum of individuals who have not been exposed to the virus, and if it should be found that the serum of such individuals is devoid of protective action, the theory in question would be greatly strengthened. If, on the other hand, such serum were found to be protective, we should have to conclude that a natural inborn immunity to poliomyelitis exists in certain individuals.

The authors (136) state that they passed the feces from a typical case of poliomyelitis through a Berkefeld filter and injected the filtrate intraspinally into a monkey with negative results. They also state that there was a rapid loss of virulence of the brain and cord of the two monkeys as shown by intraperitoneal injections of two other monkeys with negative results.

Boudreau, Brain and McCampbell (78) report for the Ohio State Board of Health certain transmission experiments on monkeys of the virus of poliomyelitis by stable flies. They were unable to transmit the disease in this manner, and also showed that the monkeys bitten by flies which had previously fed on sick monkeys, acquired no immunity to infection in that they were subsequently inoculated with an active virus intraperitoneally and exhibited typical paralysis and histological lesions. They also attempted to transfer the disease by means of bedbug bites, but were unsuccessful. Fowl ticks were also used, but proved unsatisfactory in that it appeared impossible for them to digest monkeys' blood.

Flexner (137) says: "The pathological effects are of two kinds, injury to nerve cells not in the anterior gray matter alone, but in the posterior gray matter of the spinal cord, and in the intervertebral ganglia, medulla and brain, and cellular invasion of the pia-arachnoidal membrane of the spinal cord and medulla that follow the blood-vessels into these parts, and pass into the adjacent gray and white matter. The altered vessels permit an escape of albuminous fluid and blood cells into the meshes of the membrane where they mingle with the cerebrospinal liquid, and into spaces in the tissue composing the solid white and gray matter. Sometimes the nerve cells, sometimes the meninges, vessels and supporting tissues suffer most.

"When the nerve cells are extensively injured the paralysis is marked; when the meninges are much affected the symptoms are like those of meningitis. The virus of poliomyelitis displays a high affinity for nervous tissues, but it is the wide involvement of the nutritive vascular system in the pathological process that subjects the sensitive nerve cells to so high a degree of injury and destruction."

Flexner, Clark and Amoss (143) state in a contribution to the pathology of epidemic poliomyelitis that the virus of poliomyelitis is neurotropic and localizes, and probably is capable of multiplying in the extramedullary parenchymatous nervous organs. It has been demonstrated by inoculation tests in the intervertebral, Gasserian and abdominal sympathetic ganglia. All the ganglia show histological lesions similar to those of the spinal cord and brain. Epi-

demic poliomyelitis is a general disease of the nervous system, although the most prominent and important symptoms are those following injury to the motor neurons of the spinal cord and brain. The virus of poliomyelitis is highly resistant to glycerine, in which it survives for more than two years; to 0.5 per cent. phenol, in which it survives for more than one year; while it succumbs after having been kept frozen constantly for several months.

The cerebrospinal fluid of convalescents tends to be devoid of the neutralizing immunity principles for the virus of poliomyelitis, although they may exceptionally be present within this fluid. Doubtless the immunity principles are not produced locally in the nervous tissues, but elsewhere in the body, and are carried to the nervous organs by the blood.

Amoss (144) states that the globoid bodies or minute micro-organisms, cultivated from the central nervous organs of human beings and monkeys that have died of poliomyelitis, may be detected in the incubated brain tissues of infected monkeys in forms indicating post-mortem multiplication. Identical bodies have been detected in blood films prepared on the twelfth day of the acute attack, from a paralyzed poliomyelitic monkey inoculated intraspinally.

The same organism has been cultivated from the blood of a monkey that had received intravenously a large dose of a Berkefeld filtrate of poliomyelitic virus. No other organism was detected either in the sections of the brain, or in film preparations of the blood. These observations tend therefore to confirm the etiological relationship between the minute micro-organisms and epidemic poliomyelitis suggested by the successful cultivation and inoculation experiments reported by Flexner and Noguchi (128).

Clark and Amoss (145) state that by intraspinal injections of specimens of poliomyelitic virus of suitable virulence, infection can be caused regularly in *Macacus rhesus* monkeys. The virus passes from the subarachnoid spaces into the nervous tissues in which it multiplies and into the blood. The constant involvement of the pia-arachnoid membranes in poliomyelitis, even when no paralysis occurs, and the fact that infection can readily be produced by intraspinal inoculation suggests anew that in the pathogenesis of poliomyelitis the interstitial tissue-changes within the meninges, blood-vessels and ground substance play a determining part.

While the virus injected into the subarachnoid spaces can be demonstrated there by inoculation tests forty-eight hours after the injection, it can no longer be detected on the sixth day, at a time when the first symptoms of infection make their appearance.

The failure of the cerebrospinal fluid from human and experimental cases of poliomyelitis to produce the disease when inoculated into monkeys, is due to the fact that the virus is either fixed by the nervous tissue or passes into the blood.

THE INJECTION OF CONCENTRATED SOLUTIONS OF
SALVARSAN AND NEOSALVARSAN.

A REVIEW OF RECENT LITERATURE.

By ALBERT E. TAUSSIG, M. D., of the Editorial Staff.

1. Alexandrescu-Dersca: A New Method of Intravenous Neosalvarsan Injections. (*Muench. med. Wochenschr.*, No. 29, 1913.)
2. Bine: Injection of Concentrated Solutions of 606 and 914. (*Cal. State Journ. Med.*, December, 1913.)
3. Dreyfus: Injection of Concentrated Solutions of Salvarsan. (*Muench. med. Wochenschr.*, No. 42, 1913.)
4. Duhot: Simplified Technique of Injecting Neosalvarsan in Concentrated Solutions. (*Rev. Belge d'Urolog. et de Dermat.-Syph.*, No. 1, 1913.)
5. Duhot: A New Syringe for the Injection of Concentrated Neosalvarsan Injections. (*Muench. med. Wochenschr.*, No. 20, 1913.)
6. Finckh: Technique of Salvarsan Therapy. (*Med. Klin.*, No. 13, 1913.)
7. Katz: Intravenous Injection of Concentrated Neosalvarsan Solutions. (*Muench. med. Wochenschr.*, No. 42, 1913.)
8. Ravaut: Intravenous Injection of Concentrated Neosalvarsan Solutions. (*Presse Méd.*, Nos. 21, 27, 87, 1913.)
9. Saalfeld: Technique of Intravenous Salvarsan Injections. (*Muench. med. Wochenschr.*, No. 42, 1913.)
10. Stern: Administration of Salvarsan and Neosalvarsan. (*Muench. med. Wochenschr.*, No. 13, 1913.)
11. Strauss: Concentrated Intravenous Salvarsan Injections. (*Dermatolog. Wochenschr.*, Nos. 14 and 18, 1913.)
12. Zimmern: Infusion or Injection of Salvarsan. (*Muench. med. Wochenschr.*, No. 20, 1913.)
13. Zumbusch: Intravenous Administration of Neosalvarsan. (*Wien. klin. Wochenschr.*, No. 32, 1913.)

There are to-day not many clinicians who deny the value of salvarsan and neosalvarsan in the treatment of syphilis, and this in spite of the fact that the first over-sanguine hopes have not been realized and that more or less grave accidents are not uncommon. The latter, which include painful local infiltrations, chills, fever, vomiting, various kinds of malaise, cerebral edema and even death, are due to a variety of causes. Occasionally they are unavoidable, being due to an unforeseen individual idiosyncrasy; more often they are due to too large a dosage or too brief an interval between successive injections. Usually, however, some error in technique is responsible for the unpleasant after-effects following an injection,

and this is not surprising in view of the extreme care that must be observed in following the rules laid down by Ehrlich for the intravenous infusions. Insufficient care in using perfectly fresh distilled water, or better still doubly distilled water, is still a frequent cause of complications, and the difficulty of ensuring absolute sterility of the more or less complex apparatus is hardly a less serious matter. In large clinics, in which salvarsan injections are constantly being given, these difficulties loom less large. The physicians have become very skilful, the attendants are well trained, all conveniences are at hand, and as a matter of fact complications, under these circumstances, are relatively infrequent. In private practice, on the other hand, the situation is very different, so much so that many practitioners still use intramuscular injections, in spite of the admitted superiority of the intravenous route. Any method, therefore, that simplifies the procedure for the general practitioner is to be welcomed.

At the meeting of the Société de Dermatologie et de Syphilographie, held at Paris, February 6th, 1913, Dr. Paul Ravaut described a new method of injecting neosalvarsan in concentrated solution by means of a syringe. This was the result of a number of attempts to do away with the ill after-effects often following the administration of neosalvarsan, after-effects which Ravaut believed to be due to the oxidation of the drug during the slow process of intravenous infusion. In this connection he also observed that when saline solutions were used, the neosalvarsan was oxidized much more promptly than in pure water and that, the greater the percentage of salt present, the more prompt the oxidation of the neosalvarsan. The use of considerable amounts of pure distilled water, on the other hand, appeared to him inadvisable because the solutions were then no longer isotonic and there was reason to fear the occurrence of hemolysis. Indeed, he showed that solutions of neosalvarsan, as usually administered, when mixed in a test-tube with human blood, invariably hemolyzed the latter. More concentrated solutions of neosalvarsan, however, *i. e.*, 0.45-0.6 grm. in 10 c.cm. distilled water or 0.75-0.9 grm. in 15 c.cm., never produced hemolysis. He then used these solutions, intravenously, with his patients and found that they were uniformly well borne.

Since Ravaut's publication, the use of concentrated solutions of neosalvarsan has found much favor, chiefly on the continent. Duhot, of Brussels, reports 750 intravenous injections. He dissolves the neosalvarsan up to 0.75 grm., his maximum dose, in 10 c.cm. fresh, doubly distilled water. By means of a special syringe, for a description of which the reader must be referred to the original article, he avoids almost completely all exposure of the solution to the air. The preparation of the solution requires five minutes and the intravenous injection some fifteen seconds, in itself no slight advantage. In none of his cases was there any serious complications, and the elevations of temperature that followed the injections were slighter and less frequent than after the usual method.

Stern, of Duesseldorf, still further simplifies the matter by using ordinary tap-water that has been boiled for five minutes. The water, after having been allowed to cool, is poured into a Record syringe, from which the plunger has been removed and whose lower end is occluded by the sterilized finger-tip. The contents of the neosalvarsan vial are then poured into the water, the plunger of the

syringe is inserted, the syringe with its contents inverted and the air expelled. The neosalvarsan dissolves in less than one minute. The syringe is then armed with a very fine needle and the latter thrust into a vein at the elbow, made visible by means of a ligature around the arm. The piston of the syringe is withdrawn a little, until the entry of a stream of blood into the syringe proves that the point of the needle lies within the vein. The ligature about the arm is then removed and the solution slowly injected, being careful that the needle itself does not change its position. For 0.9 gm. neosalvarsan, he uses 10 c.cm. water; for smaller doses, correspondingly less. His results were eminently satisfactory.

Katz, of Nuremberg, in the main follows Stern's method. He prefers to close the lower end of the syringe, while dissolving the neosalvarsan, with a metal cap rather than with the finger, and uses distilled rather than tap-water. Moreover, he never uses less than 10 c.cm. water, disapproving of stronger solutions. In 130 injections no ill after-effects, except an occasional slight headache, were noted.

Strauss uses a 9 per cent. solution (0.9 gm. in 10 c.cm. water or 0.45 in 5 c.cm.) which he injects intravenously by means of a Record syringe. He prefers a special double needle, an outer sharp one movable upon an inner blunt one and supplied with a set screw by means of which it can be fixed in any position. With the point of the sharp needle projecting beyond the inner blunt one, the vein is punctured. The screw is then loosened, the blunt needle thrust forward into the vein, and no further injury to the vein is possible. He does not state the number of cases so treated, but says that the injections are excellently well borne.

Zumbusch, of Vienna, is somewhat more conservative. His text is a little ambiguous, but it appears that he uses 20 c.cm. freshly distilled water to dissolve 0.75-0.9 gm. neosalvarsan. The water is put into a small, sterile goblet, the neosalvarsan added, the solution drawn up into a 20 c.cm. Record syringe and injected intravenously in the usual manner. He reports 337 injections in 149 patients. The after-effects were, if anything, less marked than with the classical method. A few patients complained of headache, once or twice there was vomiting and in one patient an urticaria. One patient in ten had a febrile reaction, which reached 102° F. in only one case.

Alexandrescu-Dersca, of Bucharest, uses much more concentrated solutions, dissolving the neosalvarsan, whatever the dose, in 1 to 2 c.cm. freshly distilled and sterilized water. This amount is drawn up into a small Luer syringe armed with a long needle. The neosalvarsan vial is opened, the water gently squirted into it, and the mixture stirred with the needle until a clear solution results. The latter is then drawn up into the syringe, the long needle replaced by a shorter one and the intravenous injection made in the usual manner. Nothing could be simpler. He reports 40 such injections, none of them followed by pain, headache or fever. Even patients with heart lesions bore the injections perfectly well.

Salvarsan, too, has been given in concentrated solution. Fehde was probably the first to do this, having for several years been in the habit of injecting 0.6 gm. of salvarsan in 10 c.cm. water intravenously. His results, though satisfactory, were never published, but his example has been followed by many others, with individual

variations, especially as regards the degree of concentration and the nature of the diluent. Thus Saalfeld, of Berlin, dissolves 0.3 in 40 c.cm. saline solution, alkalizes it in the usual manner, and injects it intravenously. He reports 250 cases so treated without any ill after-effects that could be ascribed to the degree of concentration.

Finckh, of Tuebingen, uses 0.4-0.5 grm. dissolved in 50 c.cm. freshly distilled water and treated in the usual manner. He reports over 3,000 such injections, uniformly well borne. His results with concentrated solutions of neosalvarsan were equally satisfactory.

Dreyfus, of Frankfurt, uses still stronger solutions, and ascribes his success to a rigid observance of the proper technique. Into a sterile glass vessel containing 30 c.cm. sterile, doubly distilled water, 0.4 grm. salvarsan are poured, so that the powder floats equally distributed over the surface of the water. The salvarsan must then be allowed to dissolve undisturbed without shaking the vessel or stirring its contents. After solution is complete, the proper amount of 15 per cent. sodium hydrate solution is added, with scrupulous care not to add a drop too much. The directions that come with the salvarsan almost invariably call for too much alkali. It is best to add at once an amount of 15 per cent. sodium hydrate solution corresponding to 0.12 c.cm. per 0.1 salvarsan used; then shake for a long time and add more alkali, drop by drop, shaking vigorously after each addition. The finished solution is at once drawn up into the syringe, so as to protect it from further contact with the air. The vein is then distended in the usual manner, the needle, without the syringe, thrust into it, and, as soon as the blood is seen to flow freely, the syringe is attached to the needle and the solution injected slowly. The injection should require one or two minutes. His results were entirely satisfactory, an unpleasant reaction being rather less common than after the use of more dilute solutions.

Stern, whose use of tap-water for dissolving neosalvarsan has already been described, uses the same diluent for salvarsan. Into a small vial, containing 5-8 c.cm. sterile tap-water, the salvarsan is poured and dissolved. The solution is then rendered alkaline in the usual manner and injected. For beginners, he suggests adding to the original solution, a drop of phenolphthalein. The moment of proper alkalization is then shown by the appearance of a red color. His results also were satisfactory.

Zimmern, on the other hand, reports unfavorable results, from Herxheimer's clinic at Frankfurt. The salvarsan was dissolved in distilled water and alkalized, so that a 5 per cent. solution resulted. This would make 0.4 grm. salvarsan (his usual dose) correspond to 8 c.cm., which was injected intravenously in the usual manner. In spite of the greatest care in technique, a variety of unpleasant after-effects were observed. In 50 cases of latent lues, fever resulted eighteen times, a surprisingly high proportion. In 26 of these cases, the injection was followed by vomiting, often very violent and lasting up to three days. In 10 cases, violent pain along the course of the veins was observed, suggesting an injury of the vessel walls by the concentrated solution, and once a marked urticaria resulted. These observations led to the abandonment of the method in the clinic. Zimmern's studies of the excretion of salvarsan, when injected in dilute or concentrated solution, are significant. He found, in brief, that, within the first week, at least

twice as much salvarsan is excreted, if the latter is given in the usual manner, as when a concentrated solution is used. The longer retention of the salvarsan, in the latter case, suggests that concentrated solutions may be more efficacious than dilute ones.

Our own experience with concentrated solutions of salvarsan is limited to four injections done at the Charité Hospital in Berlin, last summer. Of the salvarsan, 0.4 grm. were dissolved in 30 c.cm. distilled water, alkalized and injected intravenously by means of a large Record syringe. In one case, the injection was followed by a chill and fever; the other 3 cases showed no reaction. The greater convenience of the new method both to patient and physician was striking.

A consideration of these publications leads to the following conclusions.

1. The use of concentrated solutions of salvarsan and neosalvarsan minimizes or does away with the ill-effects due to imperfect distilled water, thus obviating one of the greatest dangers inherent in the hitherto accepted method.

2. The fact that no apparatus is required except a syringe for neosalvarsan or a syringe and a small vessel for old salvarsan involves a great simplification of technique, not only as regards bulk of apparatus, but also as regards sterilization. The use of plain distilled or possibly even tap-water, in place of the saline solution, involves still another simplification.

3. The new method surpasses the old both in being a great saving of time and also in enabling the operator to dispense with the services of an assistant.

4. For the nervous patient, the intravenous injection of a syringeful of medicine is a procedure less taxing than the slow infusion of a large quantity.

5. There is reason to believe that concentrated solutions are more effective than dilute ones, in that the salvarsan in the former case is more slowly excreted.

6. The degree of concentration permissible with neosalvarsan is apparently almost unlimited, although most observers have used solutions not stronger than 10 per cent. It may be questioned whether such strong solutions are permissible with salvarsan. Even with salvarsan, however, a 1 to 3 per cent. solution is perfectly well borne.

7. One objection to the new method consists in the urgent necessity of a perfect technique in the intravenous injection itself. It is obvious that if the needle does not lie accurately within the vein, so that a small amount of the concentrated solution enters the perivascular tissue, the results may be even more disastrous than with the more dilute solutions. The danger must be faced, of course, but need not deter the skilful operator.

THE ALCOHOL-CARBOLIC INJECTION OF THE SPHENOPALATINE (MECKEL'S) GANGLION.

A REVIEW OF RECENT LITERATURE.

By WM. CHAMBERLIN, M. D., of the Editorial Staff.

1. Holmes: The Intranasal Treatment of Meckel's Ganglion. (*Trans. Amer. Laryng., Rhinol. and Otol. Soc.*, 1913.)
2. May Otto: Functional and Histological Effects of Intra-neural and Intraganglionic Injections of Alcohol. (*British Med. Journ.*, p. 465, August 31st, 1912.)
3. Schloesser: Experience in the Treatment of Neuralgia by Alcoholic Injections. (*Verhandl. des Kongresses fuer Inn. Medizin.* Wiesbaden: J. F. Bergmann. 1907.)
4. Sluder: Rôle of the Sphenopalatine (Meckel's) Ganglion in Nasal Headache. (*New York Med. Journ.*, p. 989, May 23rd, 1908.)
5. Sluder: The Anatomic and Clinical Relations of the Sphenopalatine (Meckel's) Ganglion to the Nose and Its Accessory Sinuses. (*New York Med. Journ.*, p. 293, August 14th, 1909.)
6. Sluder: Further Clinical Observations on the Sphenopalatine Ganglion (Motor, Sensory and Gustatory). (*New York Med. Journ.*, p. 850, April 23rd, 1910.)
7. Sluder: A Phenol (Carbolic Acid) Injection Treatment for Sphenopalatine Ganglion Neuralgia. (*Journ. Amer. Med. Assoc.*, p. 2137, December 30th, 1911.)
8. Sluder: Anatomic and Clinical Relations of the Sphenoid Sinus to the Cavernous Sinus and the Third, Fourth, Fifth, Sixth and Vidian Nerves. (*Trans. Amer. Laryng. Assoc.*, 1912.)
9. Sluder: Syndrome of Sphenopalatine Ganglion Neurosis. (*Amer. Journ. Med. Sc.*, December, 1910.)
10. Sluder: Etiology, Diagnosis, Prognosis and Treatment of Sphenopalatine Ganglion Neuralgia. (*Journ. Amer. Med. Assoc.*, p. 1201, September 27th, 1913.)

In an article in the *New York Medical Journal* of May 23rd, 1908, Sluder records the fact of his attention being first called to a "headache which did not follow any of the known rules. It was irregular as to the time of its appearance and irregular as to the part of the head involved." These headaches usually followed inflammatory processes in the nose and continued long after the acute inflammation had subsided. To him these headaches seemed to be neuralgic in character and the close proximity of the sphenopalatine, or Meckel's ganglion, to the nasal mucosa suggested that it might be involved secondarily to the acute inflammatory process

in the nose. Acting on this hypothesis he began cocainizing the nasal mucosa in the neighborhood of the ganglion in persons presenting characteristic symptoms. In certain cases he was able to produce complete relief and in others partial, while in others still, he failed completely. Since the preliminary report of his hypothesis in 1908, he has recorded from time to time, both in the *New York Medical Journal* and in the *Journal of the American Medical Association*, the progress of his investigations. These writings, with the exception of those of Holmes, of Boston, are the only ones to be found on this subject, even after a most careful search of American and foreign literature.

Anatomy.—Quoting from Gray's "Anatomy," Edition of 1896, Sluder gives the anatomy of the ganglion as follows: "It lies in the sphenopalatine fossa, close to the sphenopalatine foramen. This fossa is formed above by the under surface of the body of the sphenoid and the orbital process of the palate bone; in front by the superior maxillary bone; behind by the anterior surface of the base of the pterygoid process and the lower part of the anterior surface of the great wing of the sphenoid; internally by the vertical plate of the palate." This description, together with that given in other works on anatomy, he considers misleading, in that it fails to call attention to the intimate relation of the ganglion to the nose and its accessory sinuses. From his investigations, both anatomical and clinical, he considers the pterygopalatine fossa in reality an accessory sinus of the nose. "By actual measurement Meckel's ganglion frequently lies as close as 1 or 2 mm. from the nasal mucous membrane; it may lie as deep as 7 or even 9 mm." Interpreting the description as given in Gray's "Anatomy," Sluder calls attention to the intimate relation of the ganglion above with the sphenoidal sinus, and in front with the maxillary sinus or antrum of Highmore; while in certain cases the prolongation of the sphenoidal sinus downward may bring it in close relation to the posterior aspect of the ganglion and a "posterior ethmoidal cell may bound the upper half of the anterior part of the fossa. Meckel's ganglion lies very close to the external bony wall of the nose, in which the sphenopalatine foramen occurs as a small deficiency at its upper posterior part." The external part of the fossa is then the only one which is not in intimate relation with the nose. Citing the parallelism with regard to the involvement of the optic nerve from accessory sinus disease, Sluder considers it therefore as "altogether reasonable to assume that these processes also pass over to Meckel's ganglion, although the clinical picture is very much less striking than the blindness produced by the involvement of the optic nerve." Certain symptoms, which he has observed, he is unable to explain on any other basis than as secondary to an inflammatory process in the nose proper or the ethmoid or sphenoidal sinus, though he has been unable to demonstrate any as being secondary to involvement of the antrum. This he considers explicable on anatomical grounds, as the antrum is separated from the fossa by the arteria palatina descendens and arteria sphenopalatina and their accompanying veins and sheaths.

Symptoms.—Sluder considers these "partly neuralgic (painful) and partly motor, sensory and gustatory. The neuralgic picture is pain in the root of the nose and in and about the eye, in the upper jaw and teeth extending backward under the zygoma to the

ear, frequently causing earache and pain in the mastoid, but most severe often at a point 5 cm. back of the mastoid, extending thence to the occiput, neck and shoulder-blade, shoulder, breast, and when severe, to the arm, forearm, hand and fingers, with sometimes a sense of sore throat on that side. It may appear as constant pain with exacerbations, or it may stop and reappear cyclically as a migraine; or it may stop and reappear with stabbing sharpness as a tic.

"The motor phenomena are changes in the appearance of the soft palate. Its arch is higher on the affected side, and the dimple which forms in the raphé just above the uvula in the act of gagging is deflected to the well side. The uvula is inclined obliquely to the well side. The sensory phenomena are slight blunting of the tactile sense of the soft palate, pharynx and tonsils, with like condition of the membrane of the nose of the affected side. The gustatory phenomena are confined usually to a slight blunting of the sense of taste on that side. Parageusia is rare. I have never seen all the manifestations in one case."

Holmes divides the symptoms into two classes which he considers quite distinct. "First the true tic douloureux, the distinguishing diagnostic symptom of which is an intense burning, cutting pain, lasting from a few moments to a minute or more. The second class of cases is quite different in character. It includes the severe, acute, recurring hemicranias, the chronic, almost constant hemicranias, the facial neuralgic and the deep boring suboccipital pains. A patient may be subject to one or all of the symptoms of the first class, to one or all of the symptoms of the second, or symptoms of the two classes may be present at the same time."

Diagnosis and Prognosis.—In addition to the symptoms given, Sluder has relied absolutely upon the ability of cocaine, or, in certain cases, of nitrate of silver, formalin or other solutions, applied to the region of the sphenopalatine foramen to stop the pain, as a guide to diagnosis, prognosis and treatment. Holmes has not confined his efforts by such narrow limitations, and as a result has cured certain cases apparently not of sphenopalatine origin. Applying the above ruling, Sluder's operations were "uniformly successful." Holmes considers the ability to relieve symptoms by the application of cocaine especially significant as regards the prognosis. "Of 12 cases relieved temporarily by the cocaine, 10 were later apparently cured by the alcoholic injections, and of the 34 cases not relieved by the cocaine, only 8 were cured and 6 were more or less relieved."

Technique.—Sluder was the first to demonstrate the possibility of injecting the sphenopalatine ganglion through the nose. From his observations, both clinical and anatomic, he now considers it possible to make the injection by means of a straight needle in all noses. "A needle, introduced through the nostril in a direction backward, upward and slightly outward, approaching the lateral wall of the nose at a point in the middle meatus marked by the origin of the posterior tip of the bony middle turbinate, arrives almost at once on the anterior wall of the sphenomaxillary fossa. Should its point now be pushed backward 0.66 cm. it will usually enter the sphenopalatine ganglion. Experiment has proved, however, that it is better to enter the point of the needle 2 mm. anterior to the posterior tip of the middle turbinate."

Holmes' procedure is the same except that the needle is introduced under the guidance of his nasopharyngoscope, whereas with Sluder's method direction alone is relied upon as a guide. Sluder's earliest cases were injected with alcohol alone, but the intensity of the subsequent pain led him to try other solutions. Both he and Holmes now use alcohol combined with carbolic acid in 5 per cent. solutions.

Results.—Sluder states that his "observations were drawn from experience with 214 cases, including 311 injections, as well as experiments on the cadaver. Sixty injections were done as a nerve blocking, preliminary to Hajek's postethmoidal-sphenoidal operation." He fails, however, to give accurate data as to what percentage of his cases were cured by the injections, in what percentage recurrence took place, and the number of injections necessitated in the various cases; though at one point he states that his results were "uniformly successful." Holmes, working with a smaller number of cases and not limiting his indications so carefully as did Sluder, reports 10 out of 12 cures, where cocaine relieved the pain temporarily, and 8 as cured and 6 relieved where it did not.

Sluder mentions one case of slight bleeding at the time of operation with considerable bleeding seven days later, while Holmes reports one case of almost fatal hemorrhage five days following a second injection of the alcohol carbolic solution.

Holmes considers it "justifiable and proper to follow injections as frequently as symptoms recur, until the condition is relieved. If there was no improvement after three injections he would be inclined to consider the case as hopeless as far as alcoholic injections were concerned." Sluder reinjects "when the result proves insufficient or on recurrence of the pain, using cocaine as a guide."

Holmes begins his injections with 2 drops of the solution, increases a drop at a dose; the maximum being 6. Sluder at first injected 2 or 3 drops, but induced by the number of his failures he now injects 0.5 c.cm.

DIAGNOSTIC AND THERAPEUTIC NOTES.

TREATMENT OF DYSMENORRHEA.—Stolper (*Wien. med. Wochenschr.*, No. 3, 1914). Cases of dysmenorrhea fall into two classes, those with a normal or subnormal blood-pressure and those with hypertension. The blood-pressure should be taken during the interval between menses.

1. If the blood-pressure is normal or subnormal, atropine is indicated. It may be given in doses of 0.001 grm. per rectum or 0.00075 grm. (1/90 grain) hypodermically. Good results follow if, as seems often to be the case, the dysmenorrhea is due to a vagotonic condition.

2. In hypertension, atropine is of no avail. Dietetic procedures, especially anti-constipation diet, is indicated. Exercise, massage, faradization may be tried. A brisk saline purge should be given just before the menses set in and, later, aspirin for the pain.

A SIMPLE METHOD FOR DETERMINING THE COAGULATION TIME OF THE BLOOD.—Loewenthal (*Deutsch. med. Wochenschr.*, No. 15, 1914). Before operation it is often important to know whether the blood clots properly. The determination of the coagulation time is an unsatisfactory matter both because the result is dependent upon a number of accidental factors and because the process of clotting is a gradual, not a sharply marked one. The following method seems relatively free from these defects. The time sought is not that required for complete clotting, but for the formation of a membrane over the drop of blood. A large dish is half-filled with water at body temperature. On this water float several small clean watch-glasses. One drop of blood, best obtained from a vein, is placed on each, and the dish kept covered by a glass plate. Every half minute, one of the drops is barely touched with the tip of a fine, capillary, glass tube. As long as there is no clotting, a trace of blood ascends in the tube; with the first appearance of a membrane, this no longer takes place. The soiled portion of the capillary is broken off each time before the blood is touched.

THE SALICYLIC ACID TREATMENT OF EPITHELIOMA.—Weinbrenner (*Muench. med. Wochenschr.*, No. 3, 1914). The small neoplasm is covered with pure salicylic acid and a piece of zinc oxide plaster applied over the whole. A deep necrosis results, confined altogether to the cancerous mass, the normal tissue remaining practically intact. The dressing is renewed about every third day, the necrotic mass being removed only when it has become loose. Forcible re-

moval may lead to the opening of blood-vessels and favor metastasis. When all the cancerous tissue has been destroyed, further applications cease to cause necrosis, and the resulting bright red granulations readily heal. After ulceration has begun, the application of the salicylic acid becomes very painful. This may be lessened by adding one part of anesthesin to two of salicylic acid. When most of the cancer has been destroyed, further applications usually cause no pain. The duration of the treatment is from two and a half to eight months. The writer reports 9 cases so treated, all of which were cured.

THE DIAGNOSIS OF CANCER OF THE BREAST.—Moszkowicz (*Zentralbl. fuer Chir.*, No. 3, 1914). The writer's test for mammary cancer, as distinguished from adenoma, is based upon the fact that, while the former infiltrates the tissues and compresses many blood-vessels, the latter does not. If a cutaneous hyperemia is produced over the tumor, by means of rubbing with alcohol and ether or a hot-air douche, the skin over an adenoma becomes as red as the skin over the normal tissue near by; the skin over a cancer, however, remains relatively pale. Moreover, this pallor is not confined to the skin over the tumor itself, but extends irregularly beyond it. These extensions of the relatively pale area indicate the directions in which the neoplasm is growing and offer the surgeon a certain amount of information regarding the amount of skin which should be excised.

INNOCENT JUVENILE DIABETES.—Salomon (*Deutsch. med. Wochenschr.*, No. 5, 1914). Ordinarily the diabetes of young people offers a very grave prognosis. There are, however, exceptional cases in which this is by no means true. These are the cases of so-called renal diabetes, first described by Klemperer, in which the kidneys are abnormally permeable to blood-sugar. Whereas ordinary diabetes is characterized by an excessive amount of sugar in the blood, these cases usually show a small percentage of blood-sugar even when on a diet rich in carbohydrates. Exceptionally, however, even these benign cases may have a hyperglycemia. A more constant feature is the tolerance of grape sugar. If 100 grm. be added to the diet, not more than 10 grm. appear in the urine. The patients are usually neurotics, and any nervous strain is followed by an increased excretion of sugar. They do best under an unrestricted diet and offer by no means an unfavorable prognosis.

TUBERCULOSIS OF THE BRONCHIAL GLANDS.—Warnecke (*Deutsch. med. Wochenschr.*, No. 3, 1914). The cough of bronchial gland tuberculosis is characteristic. It consists of a paroxysmal bark, much aggravated by tuberculin injections. The most certain sign is given by percussion. A parasternal dullness, especially at the level of the second and third right ribs, is very suggestive. Posteriorly, interscapular dullness especially at the fifth and sixth dorsal spine may be found. Among the auscultatory signs the most significant is the occurrence of whisper bronchophony at a lower level than

normal. In health, a whisper can be heard in children as low as the last cervical spine; in adults down to the second or third dorsal spine. If it is heard in children at the second or third dorsal spine, or in adults at the fifth or sixth, the presence of enlarged bronchial glands may be inferred.

DIABETIC FURUNCULOSIS.—Brunner (*Med. Klinik*, No. 6, 1914). Furunculosis in diabetics shows but little tendency to heal. The cause of this phenomenon seems to be an acidity or at least sub-alkalinity of the tissues. On the basis of this hypothesis, Brunner treated 2 cases of furunculosis in diabetics by means of alkaline irrigations. The abscess cavities were washed out daily with a 5 per cent. solution of sodium bicarbonate. Both cases healed promptly. He suggests that in operations upon diabetics good results might follow alkaline irrigation of the wound surfaces.

AUTOSEROTHERAPY OF PEMPHIGUS.—Holobut and Lenartowicz (*Dermat. Wochenschr.*, No. 2, 1914). The ordinary methods of treating pemphigus are most unsatisfactory. Better results have been obtained by reinjecting the contents of the blebs. The clear serum is heated in a water-bath at 56-58° C. for half an hour. If found free from pus micro-organisms, it is mixed with 0.5 per cent. phenol and kept on ice until used. Of this vaccine 1-2 c.cm. are injected every two to four days. In one case, in which twelve such injections could be made, the desperately ill, bed-ridden patient was able to be up and about after the second injection.

PREVENTION OF IODISM AND BROMISM.—Frey (*Med. Klinik*, No. 9, 1914). Calcium salts seem to have the power of preventing the toxic effects of iodides and bromides. They may either be given simultaneously with these drugs, or better still we may prescribe a 10 per cent. solution of calcium bromide or a 5 per cent. solution of calcium iodide. The skin lesions of bromism or iodism may be treated with a mixture of lime water and oil or by a 10 per cent. calcium chloride ointment.

TAR PASTE IN DERMATOLOGY.—Aoki (*Dermat. Wochenschr.*, No. 43, 1913). The following paste will be found useful in a great variety of itching skin affections, including most forms of eczema. It is contraindicated when there is moisture or much acute inflammation.

R Picis liquid.
Sulfur. depurat.
Zinci oxidi aa.....10.0
Adip. suilli.30.0
M. f. past.

CORRESPONDENCE

LONDON LETTER.

By F. G. CROOKSHANK, M. D. Lond., M. R. C. P.

Not a few meetings and discussions of more than usual interest have lately taken place in London; but hardly one, I think, has proved more arresting than that which was held, a week or two ago, at the rooms of the West London Medico-Chirurgical Society.

Dr. Harry Campbell had been announced to read a paper on some advances in the treatment of syphilis of the central nervous system; but though we all anticipated an important address, few if any were prepared for the dramatic nature of his communication.

After giving a lucid exposition of the present state of our knowledge concerning the secretion and circulation of the cerebrospinal fluid, and the localization of the *spirochæta pallida* in the brain, in cases of general paralysis of the insane—due honor having been accorded to Noguchi, whose late lecture in London was so much appreciated—Dr. Campbell proceeded (first discussing the general principles guiding us in the administration of salvarsan) to describe the method of treating what we now call parenchymatous syphilis of the central nervous system by the intrathecal injection of autogenous salvarsanized serum. This plan is best known to us through the work of Dr. Fisher, who is now in London, working at the National Hospital in Queen Square, and whose presence at this particular meeting and modest contribution to the subsequent debate were so warmly appreciated. The method is being applied with some enthusiasm in cases of *tabes dorsalis* at our various hospitals, the serum being usually withdrawn only an hour or so after the intravenous injection is made; and encouraging results are being already reported.

But, as every one will at once realize, the anatomical conditions of the circulation of the cerebrospinal fluid prohibit the hope being widely indulged in that an intrathecal injection, in the lumbar region, can seriously disturb the equanimity of spirochetes lodged in the lymphatic spaces of the cortex cerebri.

With this notion in his mind, therefore, Dr. Campbell, only a week before he read the paper to which I am now alluding, conceived the happy idea of making an injection of the salvarsanized serum into one or other of the lateral ventricles; and consulted with Mr. Ballance on the point. A suitable case presenting itself, Mr. Ballance, trephining over the vertex, then proceeded to divide the dura mater, and passing a canula down by the side of the falx cerebri, punctured the corpus callosum. Having drawn off some 10 c.cm. of cerebrospinal fluid, he injected through the hollow needle,

already *in situ*, an equivalent amount of the patient's own, and previously salvarsanized, blood serum. The operation was perfectly well sustained; and, according to the last account that I have heard, the patient has improved. The idea is, I believe, that the injections should be repeated, at such intervals as are found advisable; and it is hoped that the ultimate result will not fall short of the expectations that may well be entertained. Caution and reserve are obviously necessary; but a step in advance has been taken, and we have not heard the last of this method of intracranial medication. Perhaps it may be found, bye-and-bye, that it will be advantageous and desirable in these and other cases to introduce some drug in the nature of a formaldehyde compound, in a similar fashion, into the lateral ventricles.

The method of puncture of the corpus callosum has, of course, other applications than this just described.

In a recent case under my own observation at the Belgrave Hospital for Children, an internal hydrocephalus proceeding with some celerity, my colleague Mr. Norbury, performed the same operation; not however with the idea of introducing any medicament, but with the intention of first of all relieving pressure, and then procuring by the trauma the establishment of a permanently fistulous opening in the corpus callosum, so as to permit of the escape and drainage of the fluid in the ventricles into the subarachnoid spaces over the surface of the brain. This operation has, of course, been done before, in Germany, and elsewhere, but I do not know that it has ever been essayed in so young a patient as ours. So far all is going well, and the head is steadily diminishing in circumference, vertically and horizontally.

One is inclined to speculate as to the advisability, then, of treating even early tuberculous meningitis in the same fashion!

A discussion on radium therapy that recently took place at a gathering of the Medical Society of London was made notable by the weighty contributions, proffered by Sir Alfred Pearce Gould, Sir Frederick Treves and others on different aspects of the problems involved, but in no less a degree, by the able speech of Capt. Hayward Pinch, the Superintendent of the Radium Institute, that valuable organization which owes so much to the initiative and persistence of our late King, Edward VII.

Capt. Pinch, who speaks with great authority in an admirable sentence often deprecating the undue exaggeration of the claims of radium therapy in respect of cancer, laid it down that the treatment of cancer, *when operable, is operation*. This epigram seems to me to crystallize almost all that can at present be said. The *treatment of cancer, when operable, is operation*. But, when cancer is inoperable, or when if operation is for any reason rejected, then radium therapy may be tried; hopefully, but without promise of cure.

Spindle-celled sarcomata are, in Capt. Pinch's view, those that afford radium the best opportunity; for melanotic sarcomata it should not be used. In cases of inoperable carcinoma of the uterus, excellent results are obtained sometimes, but in cases of recurrence after Wertheim's procedure has been adopted, great caution in dosage should be observed.

For lupus, the Finsen light gives better results than does radium; but tuberculous glands, if not caseating, and if operation has been

refused, may well be subjected to it. Some inveterate neuralgias are benefited, temporarily at least; some cases of polyarthritis deformans do well. Nævi may be treated excellently, if a preliminary diascopy shows that the case is suitable. Such are some of Capt. Pinch's aphorisms, and *obiter dicta*. He had much to say on the advantages of the use of radium emanations in certain cases; and gave us an excellent and clear account of the technical methods employed at the Institute. Of course, too, he agrees with every one else that in the treatment of growths by radium, the containers should be embedded in the tissues to be destroyed and not be superficially applied.

A mere physician like myself is perhaps unduly temerarious in making allusion to so many topics of surgical interest; but I cannot help referring to the lectures recently given by Professor Hey Groves, at the Royal College of Surgeons, on the treatment of fractures by operative methods; and I confess to being fascinated by the wonderfully complete exhibition of apparatus and implements collected by him and displayed during his lectures, which have been well reported in our chief medical journals for March.

One operative method in particular often employed by Mr. Chad Woodward of the North-West Hospital and fully described by him in the *Practitioner* for March, 1914, seems to me to be very ingenious; and, as used by him, very successful. It is that known as Steinmann's method; and, though perhaps familiar in America, does not appear to be so in England. Direct extension of the limb is obtained by traction exerted by graduated weights on the extremities of a pin passed through the lower fragment of the fractured bone.

I saw recently a case thus treated by Mr. Woodward and was much struck by the excellent result—it was one of fractured femur in which there had originally been marked shortening. But the limb in the upshot was perfect. Indeed, so perfectly is the extension of the limb under the control of the surgeon that now one could, if necessary, have, not perhaps a 'cubit added to his stature,' but certainly an inch or two, by means of an oblique osteotomy of both femora, and the application of a pair of Steinmann's pins! Without, however, intending this quite seriously, it is a fact that lengthening can easily be brought about, while a real advantage is the facility with which massage can be applied from the first.

In concluding this letter I would refer to the very great interest and pleasure that has been given to us all by the visit of Surgeon-Colonel Gorgas to London. He, last week, delighted everyone by his account of the work done at the Panama Canal by the Sanitary officers under his control; and his lecture at the Royal Society of Medicine compelled the liveliest attention.

The dinner given in his honor (under, I believe, the happy inspiration of Sir William Osler) was an unqualified success, we hope; and may have served to convey to our guest some sense of the appreciation felt for his truly remarkable work.

The gathering was a notable one: Sir Thomas Barlow, President of the Royal College of Physicians, presided; and hardly one of the titular heads of the profession was absent. Nor were distinguished laymen of eminence absent; although the dinner was, primarily and of intent, a professional tribute to a great man, and fellow-worker.

I have no doubt that you have already heard of these doings; but

no letter from London should fail to express our gratification at having had the opportunity of doing such honor as was in our power to one who so notably deserves the thanks of all humanity for his example and his precepts in the ordered struggle against disease.

May 10th.

BOOK REVIEWS.

A HISTORY OF LARYNGOLOGY AND RHINOLOGY. By Jonathan Wright, M. D., Director of the Department of Laboratories, New York Post-Graduate Medical School and Hospital. Second Edition, Revised and Enlarged. Philadelphia: Lea and Febiger. 1914. Price, \$4.00.

Few men have brought to the writing of any history the initial preparation and literary qualifications which Dr. Jonathan Wright has brought to his "History of Laryngology and Rhinology." Certainly no one in America, and possibly in the entire medical world, is so well qualified to speak on the subject in question as he. The original work, of which this is a second edition, first appeared in serial form in the pages of the *Laryngoscope*. The story to the student of medicine reads like a novel, but differs from the average novel in that one can begin wherever the book chances to open itself and read with unflagging interest. The present work is the outgrowth of a hobby with which the author has entertained himself for many years, and represents the fruits of his gleanings not only from medical but from foreign history and literature as well.

The history of laryngology and rhinology is traced from the earliest times; from the Egyptian and Chaldean, the pre-Hippocratic and Hippocratic ages down to the present. While interested, or possibly amused, by the history of his specialty in the earliest times, no doubt the chief interest of the laryngologist and rhinologist of to-day will centre in the development of the modern science since the advent of the aseptic era in medicine, the discovery of cocaine, and the divorcing of his specialty from the realm of the general surgeon. Not a few will be astounded at the youth of the specialty to which they have devoted themselves and at the enormous advancement it has made in the few brief years of its existence.

"The three greatest events in the history of modern laryngology and rhinology," says the author, "are the demonstration of the utility of the laryngoscope by Czermak and Türk, the observation of adenoids by Wilhelm Meyer, and the advent of cocaine." Of Meyer he says: "It is difficult to find, in the annals of medicine, a first report of a morbid process which so thoroughly, in one essay, exhausts the subject from almost every point of view." Although Garcia's "independent discovery of the laryngoscope resulted in its utilization in founding the specialty of laryngology," it is conclusively shown that in reality the laryngoscope was made use of many years before. "Cocaine," the author says, "ranks only second to the general anesthetic in the mercies vouchsafed to the human race, while adrenalin, as an adjuvant to cocaine did more than any other two things to advance and perfect intranasal surgery."

In establishing the priority of certain discoveries—that ever-present jealousy about which so many battles have been waged—the author speaks with authority. In addition, the work is a serviceable compend of much that is valuable in medical literature. It will be of interest to every student of medicine and should be in the library of every laryngologist and rhinologist.

STAMMERING AND COGNATE DEFECTS OF SPEECH. By C. S. Bluemel. Volume I, The Psychology of Stammering. Volume II, Contemporaneous Systems of Treating Stammering: Their Possibilities and Limitations. New York: G. E. Stechert and Co. 1913. Price, \$5.00.

In his preface to the present work the author gives a list of the various characteristics of stammering which he insists any theory concerning its causality must explain. "Stammering and cognate defects of speech," he says, "have in the past been studied almost exclusively in their physical manifestations. The point of view has been that of physiology. In the present work the subject will be considered primarily in its mental aspect. The point of view will be that of psychology." In the succeeding chapters, after the discussion of eye-mindedness, ear-mindedness, the verbal image, and the location of the various brain centres, he discusses at length the relation between mental imagery and voluntary speech. The impairment of the various brain

centres is next considered and finally the various forms of aphasia. In the chapter on stammering, after disproving the generally accepted theory that the impediment is due to a delay in vocalization, he shows that the difficulty, instead of being with the consonants, as is ordinarily supposed, is, in reality, with the vowels. This leads to the statement of the thesis of the work that "the stammerer's difficulty is a transient auditory amnesia. He is unable to recall the sound images of the vowel that he wishes to enunciate." The contributory causes are mental confusion, together with fear and auto-suggestion. The final chapter on Corollaries discusses rather briefly the various means of relief.

The second volume of the work consists of a description of the various so-called methods at present in vogue in the civilized countries of the world. "Many of the systems are entirely devoid of merit. They have been recorded merely because they are the gold bricks that are daily sold to stammerers by an infamous fraternity of speech specialists. The correction of speech has not received the proper attention which it merits from the trained specialist and as a consequence at the present time has fallen very largely into the hands of quacks and charlatans."

On perusal of the volumes one cannot fail to appreciate the painstaking, careful work bestowed on the subject by one who has endeavored to approach it from a scientific point of view. The references to the literature are many and helpful. The books cannot help but place the subject on a distinctly higher plane. One might wish, however, that there might have been a more equal division of the subject matter; that, if so much space were given to the development of the theory, an equal amount might have been given to a consideration of the methods for relief of the condition with which the volumes deal.

DISEASES OF THE HEART. By James Mackenzie, M. D., F. R. C. P., LL. D., Ab. and Ed. F. R. C. P. I. (Hon.), Physician to the London Hospital (In Charge of the Cardiac Department), Consulting Physician to the Victoria Hospital, Burnley. Third Edition. New York: Oxford University Press. 1913.

The publication of the first edition of Mackenzie's "Diseases of the Heart" in 1908, marked an epoch in the study of this subject. It was so far superior to all of its predecessors and to many of its successors, that their defects became most glaring. The present third edition has all the merits of the first and presents in addition the results of the work of a leader in cardiac research. Few books in medicine so hold the fascinated attention of the reader. Its clearness of presentation, the infectious enthusiasm of the author, its unvarying calmness and sanity, the evidence that the writer's conclusions are based upon close observation and an enormous experience, the fact that the writer uses the most advanced methods and has the keenness of a genius for seizing upon the inmost significance of his observations, make the book unrivalled of its sort. It has, to be sure, the faults of its merits. Being the personal product of an eager investigator, it lacks the complete presentation of the views and work of other observers that one expects to find in a German textbook. For such information one must go to the work of less ardent minds. As it is, the book is indispensable to all who are interested in modern cardiac methods and will open a new world to most readers who see it for the first time.

"VERB SAP." On Going to West Africa, Northern and Southern Nigeria, and to the Coasts. By Capt. Alan Field, F. R. G. S. London: John Bale, Sons and Danielsson. 1913.

This handy little volume should take the place of a pocket dictionary for all who are contemplating going to the West Coast of Africa, for if a newcomer is not advised beforehand, he will certainly pay dearly for his experience. The author, in a unique manner, first considers the outfit,—an important item,—then picks one of several routes, landing on the West Coast. If the traveler is acquainted with the contents of the book he knows what to expect and how to meet the shortcomings. Special paragraphs are considered, written by those who know, such as the health, climate and the seasons, outdoor sports, servants, languages, and a special department for ladies. While the contents apply mostly to the West Coast, in general it will apply to the whole of tropical Africa; hence it may be reiterated that to complete an outfit for this sort of expedition the book under consideration should occupy an important place.

ORIGINAL ARTICLES.

SOME DISEASES OF PLANTS AND ANIMALS.

By WILLIAM MARTIN SMALLWOOD, Ph. D., of Syracuse, N. Y.,
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The writer is frequently asked, Are plants and animals ever sick? What effect does disease have on plants and animals? Is there any similarity between the diseases of plants and animals and those of man? These three general questions suggest problems of current interest to us all, but before attempting to answer them we must clearly understand what is meant by disease.

It makes but little difference where one begins his study, in what group of plants or of animals. Take the common dandelion which many of us regard as a weed and a pest in the lawns. It is generally distributed in open lots and along the sidewalks in the uncared for parts of most cities. The typical and normal plant has a round flower stalk and symmetrical blossom. If one examines more closely the flowers of a number of specimens, there will be found some with a wide, flat flower stalk supporting an irregular overgrown flower. The width of the flower and its stalk is frequently three to five times larger than the normal blossom and stalk. When these conditions were first studied, they were interpreted as normal variations; but further observations indicated that the soil was too rich and that these plants had been overeating of the good things in a dandelion's life with the result that abnormal giant flowers were produced. No one so far as I know has attempted to work out the exact chemical stimulus that is responsible for this excessive growth, but the writer is inclined to think that we may say that these dandelions with abnormal flowers are diseased. Every spring in New York state there blossoms an early flower, the spring-beauty (*Claytonia Virginica*) and frequently brownish blotches are found on the leaves. As the blotches spread the leaf curls up, and, if several leaves are attacked, the dainty flower withers before the seeds have ripened. The blotches are due to the growth of one of the leaf moulds, the hyphæ of which have penetrated into the mesophyll of the leaf. Here they absorb the nourishment which should go to the leaf. If the mould is suc-

cessful, its reproductive elements ripen and spread to other plants. If the spring-beauty is successful in resisting the attack, the seeds mature. The spring-beauty having these brown blotches on its leaves is diseased. The mould that is living at the expense of the spring-beauty is termed a parasite.

Recently the writer found a frog with very large and irregular-shaped kidneys. The normal kidneys of the frog are about 14 mm. long and 4 mm. wide, rather flat, oval bodies lying in the posterior part of the coelome. In color they are dark red, the familiar color of kidneys. On the ventral surface of each there is an elongated, somewhat irregular band of tissue, the adrenal, which extends nearly the entire length of the kidney. A cross section of the kidney shows that the adrenal varies in thickness, being somewhat flat on the ventral surface and dipping into the kidney, giving the adrenal a hemispherical shape. The adrenal occupies only a small part of the kidney. These irregular-shaped kidneys were 21 mm. long and 8 mm. wide. The increase in size affected the thickness and color. The color was whitish with very little evidence of any brown pigment such as is found in similar tumors in the human kidney. Both kidneys had a large number of lobes (of different sizes) each having a rounded outline. Upon gross examination of the dorsal side of each, there was no evidence of the presence of kidney tissue. On the ventral surface of the left kidney there was a narrow band of kidney tissue while the rest of the kidney was concealed. The urinogenital duct left the kidney mass from the inner border instead of the lateral, the normal position in frogs. Certainly the kidneys of this frog were abnormal, and the very limited amount of normal kidney tissue present suggests that they were unable to perform their normal functions. This frog was diseased, and we do not know what the chemical stimulus was that started the columnar-celled carcinoma to growing until these tumor cells became many times more numerous than the kidney tissue.

Horses with a large leg, especially just above the hoof, used to be a common sight in cities. Occasionally we see one nowadays. Those familiar with horses have noted scars on the face, sometimes extending clear around the head. Each condition is an illustration of old disease and the causes are well understood. The name 'glanders' or 'farcy' is given to this condition which is usually confined to horses, donkeys and mules. "Human beings, sheep, and goats are susceptible. Cattle are immune." When man contracts this disease it is invariably fatal.

The cause is a minute bacterium (*B. mallei*) which takes up lodgings in the respiratory tract. Here there result a number of ulcers on the mucous membrane accompanied by a discharge from the nose. The size, color and shape of these ulcers is definite, and to those familiar with the disease, very characteristic.

In the case of the abnormal flowers of the dandelion and the enlarged kidneys of the frog, we have diseased conditions that may roughly be compared to the tumors and cancers of human beings. The writer does not mean that they are alike in any sense as to cause, but there appear to be certain undetermined chemical causes which stimulate the cells to unusual growth with the well-known results. The blotches on the leaves of spring-beauty and the glanders in the horse are due to a specific plant living on or in the tissues of the host. In each case the foreign organism is a parasite, and the source of the poison which causes the ulcers, for example, can be traced to these parasitic bacilli mallei. We know much more about these parasites and their relation to disease than we do about the abnormal growths.

To get the full significance of the word parasite and the relation of this habit to disease, it is desirable to examine the problem of parasitism as a general problem in adaptation. It is difficult to mark off sharply the habits of organisms. Each is limited to size and occupies a definite place in nature. The mere fact that this statement can be made implies that every organism is fitted to live in the place where it is found. Here, surrounded for the most part by inanimate particles, it lives its life. In one sense, all nature constitutes its environment, but in a more restricted sense its immediate surroundings most deeply affect the various parts of the organism. Animals and plants have become adapted to living in the water, on land, at sea level, on the mountain top, in the tropics, in the Arctic circle, in short, everywhere on our globe. But when man attempts to transfer plants and animals from one environment to another then the force of adaptation is realized. Most organisms become so thoroughly adapted that they cannot be transferred; the polar bear cannot live in the tropics for any length of time, the palms of the South die in the North unless housed. Examples could be indefinitely multiplied. We must keep in mind that each organism begins life in a single cell and that each organ, as it assumes its work in the body of the organism, gradually acquires certain physiological ways of working that add to the success of the whole organism with the result that adaptation is really a problem that must go to the protoplasm for its last analysis. Besides the changes involved in day and night, in temperate regions there is the seasonal adaptation, especially of the winter, when the leaves are shed and the birds migrate to a warmer clime. The habits of each group of animals indicate that some prefer the night for foraging while others are more successful during the day. At bottom, all these varied and numerous adaptations are specific differentiation in cell structure or cell physiology.

With the diversified physiographic conditions that obtain on the globe, it is to be expected that organisms will have developed many

unusual methods of gaining a livelihood. The profligacy of nature in producing such vast numbers of individuals has resulted in her constantly turning loose more individuals than can find a foothold. The struggle for food is the most satisfactory explanation for the origin of some of these peculiar habits. Cooperation began in nature with the first pair of animals. This pairing springs from a universal necessity for all of the higher animals—namely, to insure the perpetuation of the species; for this united energies are required, especially where parental care exists. This means that the individual is not the social unit but rather the two animals that have paired either temporarily or permanently. In those animals that exercise no care of the young, there is usually an enormous drain in producing a large number of eggs and sperms which compensate in part for the lack of parental care. The necessity of having a place to live, whether it is temporary or lasting, implies ownership of that place for the time being; with some animals this simply means a limited occupancy, while with others possession is exclusive.

The term 'parasitism' was employed at first to describe the condition of those who sat around the tables of the rich in ancient Greece receiving their invitation through fawning and flattery. When the word was used to describe a similar relation among animals it was applied to animals that take to a thievish existence as unbidden guests in or on other organisms. Our knowledge of the facts of parasitism goes back to the sanitary code of the Jews and Egyptians, which declared as unclean such animals as pig, rabbit and dog, animals now known to be especially infected with parasites, and it is only within recent years that our sanitary laws have made the pig a clean meat. During the Middle Ages the schoolmen perplexed themselves with quaint hypotheses as to the time and place of the introduction of parasites into man. The idea that life could spring suddenly into existence was a fruitful suggestion for their origin; and it was not until the eighteenth century, when the life history of one of the flesh-eating flies was completely worked out, that scientific men began to suggest that parasites arose from free living animals. This discovery led to a truer knowledge of the origin of parasites, and from then on until to-day there is not a parasite known that cannot be traced to some antecedent life.

It would greatly add to the clearness of our thinking, if it were possible to make a definite classification of the parasites, but that is one of the very difficult problems in biology. A brief study of the many papers upon parasitology shows that the word parasite is qualified by such terms as obligatory, facultative, internal, external, temporary, permanent, etc., and frequently it is explained that these qualifying terms are used with a specific meaning in the discussion. It is only a step from the carnivorous habits of a wolf,

a snake or petromyzon to the blood-sucking of the leech or mosquito. In the case of all the animals just named except the mosquito, the animal attacked is killed. We call petromyzon and the leech parasites, but do not apply this term to the wolf or snake. In short the term parasite is one that has no absolute meaning, and may refer to habits that are usually regarded as entirely distinct from parasitism. The writer supposes the most important fact to be gleaned from this review is that parasitism is a habit—an acquired habit, if you please, which differs but little in many instances from what are regarded as the normal feeding habits of animals.

It is well in this connection to remember that parasitism is very extensive among plants and animals. Not only do all the higher animals harbor parasites, but as soon as a careful study is made of the smaller animals, they are found to be parasitized, even to the protozoa. One expert recently said that "it is not a too sweeping generalization to state that every living thing, large enough to contain another living thing, is subject to invasion by parasites. The protozoa, themselves single cells, often play the part of host to smaller protozoan cells, and parasites often infect the nucleus of ameba, paramecium, vorticella, and other types." The word parasite is best limited to such plants and animals as literally take up their residence for a time upon some other form of life which is the host. This means that the parasite is always smaller than the host, although it may be a higher organism. In most instances, parasites are simpler in structure than their host, as the tapeworm in dog, or ameba in man.

If all parasites had been able to grow to maturity by living on or in a single host, the problem of unraveling their life history would be very simple, as also the devising of a method for their extinction. It would not have taken so long to learn the cause of malaria and its prevention. This is the phase of parasitism that is most difficult. The work that biologists have done along the line of solving the life histories of parasites constitutes a brilliant chapter of results deserving of the splendid recognition that it is receiving.

It must be obvious, if parasitism is so extensive in nature, that its results are in the main not serious. This means that while a given parasite is living at the expense of the host and depleting its strength there is no indirect poisonous effect. An examination of the lungs of the frog will usually reveal the presence of a number of flatworms, and both the worms and the lung appear to be in a healthful condition. The kind of parasite that is found in the body is the fact of great importance in its relation to disease. The same frogs in our laboratories that had flatworms in their lungs this fall harbored the *B. hydrophilus fuscus* in their blood, and a definite disease known by the common name of 'red leg' killed these

same frogs off by the dozen. The excreted toxins of *hydrophilus fuscus* caused extensive hemorrhages accompanied with a destruction of the red blood cells. The interesting further fact is that as soon as the tanks were sterilized and the temperature reduced, the frogs were able to withstand these bacilli parasites.

We may summarize the discussion of parasitism by pointing out that parasitism is the natural result of animals and plants seeking to gain the food necessary to their existence. Taking the animal kingdom as a whole, parasitism is neither fatal nor always the cause of disease. There seems to have grown up in many cases a kind of immunity to the presence of certain parasites as is illustrated by the presence of flatworms in the lungs of the frog or the resistance of the red leg disease when the temperature is sufficiently reduced. A small number of parasites is rarely injurious. It is to be expected that the same stimulating cause will force organisms that are now free living into the parasitic habit and new disease may be the result.* The question to what extent parasitism is really fatal to animals remains to be answered. A brief review of the conditions in bees and fishes will serve to illustrate well this phase of the problem.

*Some Bee Diseases.***—The adult bees in this country suffer from two diseases—paralysis and dysentery. Dysentery in one form is infectious and believed by Zander to be due to the presence of a protozoan in the mid-gut region of the intestinal canal. This portion of the intestine in diseased bees, which died of the virulent form of dysentery, was found to be milk-white and completely filled with spores. These protozoan spores (*Nosema apis*) were present in the excrement on the frames and walls of the hive. This disease is very destructive when once established. The cause of the so-called non-infectious form of dysentery and paralysis is not well understood.

The most serious losses to bee-keepers come from diseases which occur in the larvæ and known as the American foul brood. "The brood affected with this disease is usually capped before it dies. The color of the dead brood presents in general various shades of brown. The marked ropiness of the decaying remains of the dead larvæ is probably the most characteristic and well-known feature of the disease. This disease is clearly an infectious one." The cause of this disease was first thoroughly worked out by White in 1907. The difficulty had been to find a suitable culture medium in which the spores would grow. This difficulty was overcome in the following way which is quoted in full because it may have a wider

*Smith: A New Type of Bacterial Disease. (*Science*, Vol. 38, No. 991, p. 926, December 26th, 1913.)

**Phillips and White: Historical Notes on the Causes of Bee Diseases. (Bureau of Entomology, Bull. No. 98, 1912.)

application. "Young pupæ were used in making the medium. These were picked from a comb containing healthy brood, crushed, strained through cheese-cloth, and then diluted by adding water equal to from 20 to 50 times the volume of the crushed brood used. This solution was then passed through ordinary filter paper and subsequently through a Berkefeld filter. In this way a sterile filtrate was obtained. About 2 c.cm. of the sterile filtrate was then added by means of a sterile pipette to liquefied agar which had been cooled to 45 or 50° C. If pure cultures were desired, agar tubes thus prepared were inoculated with a small amount of diseased brood, and plates were poured. If, however, culture growth was desired for the inoculation of bees or experimental animals, it was obtained from these specially prepared agar tubes by first inclining them and then securing the growth by inoculating the surface of the inclined agar with a pure culture of *B. larvæ* obtained from the plates. At no time was this special medium to reach a high temperature. Two colonies were now fed the scales of American foul brood, suspended in syrup. American foul brood resulted from these inoculations with symptoms the same as are found in an apiary in which the disease appeared through the natural means of infection. Having demonstrated the fact that American foul brood can be produced by feeding, and having obtained pure cultures of *B. larvæ* in suitable form for inoculation purposes, the next step to be taken, very naturally, was to inoculate healthy colonies with pure cultures of *B. larvæ*. This was now done, and as a result of such inoculations American foul brood was produced with symptoms identical with those produced when the scales were used for feeding. The decaying brood in the disease thus produced contained the large number of spores that are always found in brood dead of this disease, and from the diseased material pure cultures of *B. larvæ* were obtained. The result obtained from these experiments, in which pure cultures of *B. larvæ* were used in making the inoculations, justified for the first time the statement that American foul brood was caused by a specific micro-organism."

Does not the above satisfy the most exacting test that our bacteriologists apply?

Some Fish Diseases.—In this German work* published in 1906, more recognition is given to European writers than to the American, and yet there is a most interesting array of facts. Some twelve different kinds of bacteria are well known in their relation to as many different kinds of disease. As many species of *Saproglenia* have been discovered living on various parts of the fish, and each species is responsible for a definite phase of the saproglenia-like disorder. More than forty species of sporozoa have acquired the

*Bruno Hofer: Handbuch der Fischkrankheiten.

habit of living in the bodies of fishes. It is interesting to note, in passing, that a fish disease, termed smallpox, has been traced to a sporozoan (*Myxobolus cyprini* Hofer and Doflein). About two dozen species of *Crustacea* spend part of their lives upon fish, while more than two hundred parasitic worms have been reported as living at the expense of fishes. That nearly three hundred species of plants and animals are reported in this German work is a fact of much interest. When the American species of fish parasites, that have escaped the notice of Hofer are added to this list, the total number must be well over three hundred.

There is probably no group of vertebrates that is more subject to parasitism than the fishes. This is due to their continuous life in the water which is the natural home of bacteria, water moulds, protozoa, crustacea, and worms; and even the land forms of many of the animals related to these groups spend their larval existence in the water, so that the fish is living in the same medium as these parasites all the year. Were it not for the admirable protection furnished by the scales and the mucus, a fish would have small chance of escaping some of the hordes of organisms that have taken on this peculiar habit of existence.

These parasites are found in the muscles, skin, blood, gills, kidneys, reproductive organs, digestive tract, liver, gall-bladder, swim-bladder, nervous system, ears, eyes, etc. Again we must state that each organism produces a specific series of changes resulting in a definite and well marked disease. If there is any doubt in the minds of the readers of this article, let them try to diagnose the conditions in some of the fish epidemics. With the increasing care and protection that is being given to game fishes, there is a growing demand for some one who is expert in preventing disastrous epidemics especially during the hatching period. There are some half dozen experts in fish disease in the United States now and there is great need of many more. We may expect in the near future that a few men will give their time to prophylactic methods in fishes just as our public health servants are helping to keep our cities free from epidemics among the school-children and the general public.

The parasites in fishes serve to illustrate one of the problems of disease in an admirable manner. The writer refers to the complicated life history which is so characteristic of most of the parasitic worms whether they occur in man, the dog, bird, or fish. The writer, as well as several others, has been trying to work out the full life history of one of the flesh parasites in the perch and bass. This particular worm is a trematode which has been known for more than fifty years. It is common in many parts of the eastern United States and is reported from Brazil. The species is known as *Clinostomum marginatum*.

A better appreciation of the difficulties involved in unraveling the life history of *Clinostomum* is reached, if we outline what is known about the development in some of the other distomes. This group of flatworms is exclusively parasitic in the early and mature stages. The egg is enclosed in a chitinous shell and supplied with a mass of food cells. These eggs may be attached to the host. In one species (*gryrodactylus*) the eggs develop in the body of the parent. The eggs of polystomum hatch in six weeks after oviposition as a minute larva (.3 mm. long) which swims about freely; but, if in twenty-four hours it does not become attached to a tadpole, it dies. After a time it reaches the bladder by traveling the length of the digestive canal. Here it remains three years before attaining maturity.

The development of distomes is indirect. From the egg a larva arises which enters a temporary host. "Here it gives rise by a peculiar process to numerous individuals of a second larval form, and these usually produce a third form from which the minute immature trematode is developed." Thus a large number of sexual individuals may be derived from a single egg. The larvæ usually live in molluscs, the mature worm in vertebrates, and the immature but metamorphosed trematode in either host.

The majority of distomes are hermaphroditic and many are capable of self-fertilization. In such cases the sperms ripen first and pass over into the uterus. The so-called egg consists of a fertilized ovum and a mass of yolk cells. After the larva becomes attached to its host, it may degenerate into a sac-like structure full of germ cells; and in this stage is designated as 'sporocyst.' The masses of cells in the sporocyst may give rise to another generation of larvæ. Certain structures become characteristic of this larva, such as a pharynx and straight digestive sac. The name 'redia' has been given to this second larva. The redia moves about in the sporocyst and eventually bursts the wall, thus escaping. The free rediæ in turn may give rise to new individuals, the 'cercariæ.' "The cercaria is just visible to the naked eye and has an oval or discoidal body and usually a long tail of variable form." The body of the cercaria contains in miniature all the organs of the adult.

It is readily inferred from the above outline, all of the stages of which undergo a great deal of variation, condensation and abbreviation, that the task of working out the full life history is beset with many difficulties. The first and foremost question is to know how many hosts are necessary for the complete development of *Clinostomum marginatum*. In order to prevent these parasites from entering the fish, it is necessary to eliminate one of the hosts. If all these hosts are snails, insect larvæ, etc., there is no way of preventing thousands of food fish from being rendered unfit for eating. But if one of the hosts should prove to be a definite water

bird, then it would be possible to eliminate for a time this particular bird until the fish should become free from the parasites. It is believed by many workers that the encysted worm in the muscles is set free in the digestive tract of the heron, bittern or some other of the lower water birds. This makes these birds one of the necessary hosts in allowing *Clinostomum marginatum* to complete its life history.

Malignant Growths.—Malignant growths in plants and animals have not until recently received the careful attention that such conditions deserve. For many years physicians were so intent upon explaining all disease phenomena in terms of man that they ignored the broad biological relations. Plant and animal pathologists were just coming into existence as specialists, and the more obvious or more important economical phases of disease first occupied their attention. One illustration from plants must suffice.

*Crown Gall.**—Crown gall is a disease which occurs on a variety of plants, and any part of root or shoot is liable to attack. It consists in an irregular growth which frequently becomes larger than the root or shoot upon which it occurs. In this growing mass of cells the conducting tissues are imperfectly developed. The way that the cells grow and their manner of dividing, both tend to place this disease quite apart from the usual diseases in plants, locating it in the category of the true tumors; it is believed by Smith that the conditions are similar to animal tumors. The cause of crown gall has been one of the unsolved problems until the recent work of Smith and his collaborators. The successive steps employed in demonstrating that crown gall is due to a definite organism were the following: Galls were crushed in beef broth, from which agar-plate cultures were made, which were kept at temperatures varying from 20 to 30° C. The galls were thoroughly cleaned and modern antiseptic methods used. The second step was the finding of a definite organism (to which the name *Bacterium tumefaciens* was given) growing on the agar-culture plates. The third step was to demonstrate that the bacteria isolated on the agar plates would cause a similar growth when introduced into the tissues of a healthy plant. On June 1st inoculations were made into the stem of young healthy daisy plants growing in the pathological greenhouse. On June 18th a distinct elevation was visible at each point where an inoculation had been made. The fourth step was the study of these new galls and the finding of the same organism present.

The bacteria causing this disease are located inside the cells, and it is the "stimulus of their presence which causes the cell to divide

*Smith, Brown and Townsend: Crown Gall of Plants: Its Cause and Remedy. (Bureau Plant Industry Bull. No. 213.)

Smith, Brown and McCulloch: The Structure and Development of Crown Gall—A Plant Cancer. (Bureau Plant Industry Bull. No. 255.)

abnormally by throwing it out of balance." After the crown-gall tumor has been grown, another series of changes begin. It seems that the soft tissues cannot be adequately nourished beyond a certain limit and decay sets in. "A variety of saprophytic bacteria and fungi take part in disintegrating the overgrown tissues. Among these saprophytic bacteria there are several white forms closely resembling the gall organism as grown on agar-poured plates, dendritic white forms, green fluorescent species, yellow species, orange species, pink species, etc."

Animal Cancers—Drs. Bashford and Murray both claim that cancer is ubiquitous in man and vertebrate animals.* In a summary of the zoological distribution of cancer the following facts are recorded: The various kinds of malignant new growths in mammals are so similar to those occurring in man that a description of the individual tumors is found to be unnecessary. Not only are some fifty malignant new growths reported from the domestic dog, eleven from the cat, twelve from the horse and eighteen from the cow, but the jackal, the gazelle, the lioness, the rabbit, a tiger and a marsupial also suffer from similar diseased conditions. The location and kind of new growth is the same in domestic and wild animals, the most common being sarcomata and carcinomata with their various subdivisions as spindle-celled sarcoma, squamous-celled carcinoma, etc. An adenocarcinoma in the mamma of the dog was transplanted and was propagated through three generations.

The record of tumors in the birds is scantier than in mammals, but it is known that new growths similar to those referred to in mammals have been found both in domestic and wild fowl. As yet no malignant new growths have been reported from the reptiles. A fibroma in the stomach of the python and a papilloma of the occipital region in a lizard complete the observed facts in this class.

As yet but few new growths are known to occur in amphibia and these almost exclusively in the higher order, the anurans, but so far as the data have been accurately collected these new growths are similar to those occurring in the mammals.

Fish.—"Since the first authentic case of carcinoma in a fish—namely, of the thyroid gland in a trout, was submitted to us in February, 1903, by Mr. Gilruth, over 2,000 additional cases have been reported to us from the same and other hatcheries.

"In fishes a considerable number of new growths have been recorded. With the exception of a case of carcinoma of the thyroid in trout, a large proportion of these are either regarded as benign in character or classified with the sarcomata."

The recent work of Gaylord and Marsh** presents a full review of

*E. F. Bashford and Staff: Third Scientific Report on the Investigations of the Imperial Cancer Research Fund.

**Carcinoma of the Thyroid in the Salmonoid Fishes. (*Bull. Bureau Fisheries*, Vol. XXXII, No. 790, April 22nd, 1914.)

the literature and present status of our information in regard to this disease. The normal thyroid follicles in the trout resemble those of the mammalian thyroid, but the gland is not definitely confined. These thyroid tumors have been observed in sixteen species of salmonoids or in hybrids made among these. The disease is usually endemic and occasionally epidemic.

"Feeding of fish tumors, or of human cancer, to brook trout has not during a period of seven months produced the slightest evidence of the disease attributable to this feeding. The fish tumor has not yet been successfully transplanted, but implants have grown slightly and were alive at the end of three months. . . . Either of the elements, iodine, mercury, or arsenic, dissolved as salts in the water in which the fish are living, interrupts the progress of the disease and restores the thyroid epithelium to a condition approximating the normal."

These writers believe this disease to be the same as endemic goitre.

GENERAL CONCLUSIONS.

1. Animal and plants are sometimes sick, and the cause of the sickness falls into two general classes: (a) Disease due to a definite organism living as a parasite; (b) disease of a cancerous nature the cause of which is still unknown. Animals die in great numbers from the parasitic disease, and the damage to domestic animals and plants is several hundred millions annually in the United States. The annual loss from hog cholera alone is 69 million dollars, while the damage done by insects not including their relation to disease in man is estimated at 80 million dollars annually. Pass in review the cereals, the cotton, the fruit, the bees, cattle, etc., and we realize that the total loss is enormous.

2. The diseases of plants and animals are as distinct as those found in man. The nature of the cause determines the effect. The malignant new growths are so similar in many instances that the description given in our pathologies of man may be used for those occurring in animals. It is not to be expected that a disease in a plant will be the same as one in man or animals. The tissues are so different and the organization of the parts of the body are built upon such a different plan that it is not to be expected that a very close similarity will exist. The plant pathologist, however, is guided by definite changes and characteristic lesions, growths, etc., just as are those who specialize in the diseases of man.

3. There are a number of diseases that are common to man and to animals, such as glanders and tuberculosis. But in the main so far as the parasitic diseases are concerned, the specific organism is not the same and consequently the results are not the same. We

do not know just what would happen if some of the bacteria, protozoa and worms that are common in fish should gain access to man. When the difference in the nature of the organs and their probable physiological differences are taken into account, the minor differences in the several diseases are understood and explained. When we say that diseases are similar in man and animals, we mean that similar causes are responsible and not that the pathological results are identical.

LYMPHATIC TUBERCULOSIS SIMULATING HODGKIN'S DISEASE.

By JOSEPH M. PATTON, M. D., of Chicago,

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(Pathological Report by Wayne W. Bissell, M. D., Resident Pathologist Cook County Hospital.)

Scattered through the literature relating to general adenopathies we find occasional references to a peculiar form of general adenopathy, occurring frequently in negroes, which resembles in its general course and clinical features various types of general glandular involvement, but more especially the leukemias, and which eventually prove to be tubercular in nature.

Ever since Hodgkin, in 1832, described that type of progressive enlargement of the lymphatic glands which Wilks associated with the former's name, there has been confusion as to the nature of this disease, and, as the lack of definite blood changes is quite universal in this affection, it naturally follows that it is the special form of general adenopathy to be differentiated from general lymphatic tuberculosis.

Pseudoleukemia (Cohnheim) has been presented to us under so many disguises of nomenclature, that, as a disease whose essential nature and even clinical entity as a malady is still under discussion, we may not wonder at errors of diagnosis. Anemia lymphatica, adenia, generalized lymphadenoma and pseudolymphemia are some of its names; and in the literature we find malignant lymphoma of Billroth, and lymphosarcoma confused with pseudoleukemia. As these latter are histologically different (there is involvement of the capsule of the gland and adjacent tissues, and metastases occur in widely different structures), they do not belong in the same category with Hodgkin's disease.

Of late years the discussion has been between those who maintain the tubercular nature of Hodgkin's disease and those who uphold a specific histology, and claim the associated or terminal nature of tubercular changes found in connection with the peculiar features which are held to be characteristic of pseudoleukemia. In the latter regard the etiological factor is asserted to be a definite infection. In this country this is maintained particularly by Bunting and Yates, of Ann Arbor. They described a diphtheroid organism

obtained in pure culture in several cases of Hodgkin's disease.* Subsequently they reported** that by repeated injections of this organism into a monkey they have produced progressive enlargement of a single group of glands, which showed histological changes identical with those seen in lymph-nodes in human beings with glandular changes of similar duration—a chronic lymphadenitis with a typical proliferation of the endothelial cells, a beginning proliferation of the stroma tissue, and a well-marked eosinophilic infiltration; also a periglandular sclerosis. Clinically, the blood showed the characteristics of the early stages of Hodgkin's disease.

Fränkel and Much, in 1910, described a polymorphous diphtheroid bacillus found in smears derived from Hodgkin's disease. This is, probably, the same gram-staining, non-acid fast organism cultivated later by Bunting and Yates, Negri and Mieremet, and recently by Rosenow.

Sternberg, Musser, Sailer, Crowder and others based their tubercular argument on the presence of the tubercle bacillus in the glands in some cases, and on successful inoculation even when the glands did not show bacilli. To these arguments Westphal opposed the facts that bacilli are absent from the glands in most cases, and inoculation is negative. Reed claims that the histological changes in Hodgkin's disease are specific and distinctive, and that tuberculin tests are negative in typical cases. The histological picture consists of proliferation of the endothelial and reticular cells of the glands; formation of lymphoid cells from mother cells of lymph-nodes and from endothelial cells of reticulum, characteristic giant cells formed from proliferating endothelial cells and which differ from those of tuberculosis; great proliferation of connective-tissue stroma leading to fibrosis; eosinophil cells—a marked feature of a large proportion of cases. Secondary tubercular infection may be differentiated in sections of the glands.

Kundrat, Ribbert and others recognized, pathologically, two provisional groups: A true pseudoleukemia exhibiting a true lymphocyte proliferation in the gland—a chronic disease of the lymph apparatus with no lymphemia but sometimes a relative lymphocytosis. In some instances this type may be a more local glandular disease—a lymphosarcomatosis. Again the gland shows inflammatory granulation tissue with all variety of cells, round, epitheloid, giant, polymorphonuclear, etc., represented by cases with febrile attacks, reduction in lymphocytes, and sometimes leucocytosis. They consider the etiology, in this form, doubtfully infectious, tuberculous, or syphilitic.

Litten recognized two forms of pseudoleukemia, a splenic form and lymphatic form. Also two types of the latter, hard and soft,

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which included the malignant lymphoma of Billroth, but was differentiated from the lymphosarcomatosis of Virchow by heteroplasia, adhesion of tumors, and other inflammatory symptoms. To-day such a classification is regarded as encroaching too far on those forms of disease showing definite and constant splenomegaly.

Hodgkin's disease may run a rapid course of three to six months, or may last two or three years. According to Struempell, the blood shows a red count of from 2,500,000 to 3,000,000, with no increase in the lymphocytes which may be diminished. There may be an irregular leucocytosis, especially during febrile periods.

The small mononuclear leucocytes may be relatively increased and a terminal leukemia may rarely occur, but as Martin suggests, these cases may have been leukemia from the first.

The temperature of pseudoleukemia may be continuous, remittent or intermittent. There may be periods of two or three weeks of fever alternating with shorter periods showing no fever. (Chronic recurring fever of Pell and Ebstein.)

The superficial lymph-glands are first and most extensively involved as a rule, the cervical, axillary, mediastinal and bronchial groups being prominent. The retroperitoneal and inguinal glands are usually involved late and may never be sufficiently so to cause symptoms. The spleen is said to be enlarged in 75 per cent. of the cases.

In the early stages the glands are soft and elastic. Later they may be hard. They are painless and usually not tender. They are discrete, fusion seldom occurs, the capsule is not infiltrated and adjacent tissues are not involved. On section the glands are of grayish or yellowish white, translucent appearance, and may show intersecting strands of fibrous tissue. Without secondary infection there will be no caseation or necrosis. Litten states that suppuration, cheesy degeneration and calcification indicate tuberculosis, while cellular hyperplasia with or without thickening of the reticulum indicates pseudoleukemia.

The condition of the patient is usually good at first. In the acute type there is rapid enlargement of the glands and advancement of the cachexia. In the more chronic forms it may be a year or more before the internal glands cause any symptoms, and they may never do so. The cachexia develops slowly. A great variety of pressure symptoms develop relating to the locality and extent of the glandular enlargement. These and the progressive anemia and cachexia, with irregular fever, constitute the features of the later stages of the disease.

We have already seen that there is a form of glandular tuberculosis which closely resembles in its clinical features pseudoleukemia. The similarity is particularly close if we recognize that there is, as Osler insists, two types of glandular tuberculosis, acute and

chronic. They present a diffuse tuberculosis of all or nearly all the lymph-glands with little or late involvement of internal organs or other tissues. There is continuous and irregular fever, as a rule, slow or rapid cachexia, and increasing anemia.

The external bronchial retroperitoneal and mesenteric glands are affected. The special glandular features, their local character, a tendency to spontaneous healing, and, in the glands of the neck, a tendency to suppuration, which marks scrofulosis, are not present here as the glandular involvement is general, the enlargement of individual glands is slowly progressive, or perhaps they become stationary, and the glands may not break down, at least in the acute type.

The local features may exactly reproduce those of pseudoleukemia with the exception, perhaps, of the enormous size of certain glands in the latter disease. The individual gland is elastic, movable, smooth, ovoid or globular in form, unattached, painless and not tender, and a collection of glands may show the same lobulation as in Hodgkin's disease. The spleen is not so liable to show enlargement.

The fever range may correspond to that of pseudoleukemia with the exception of the apyretic periods which are sometimes present in the latter; but as this feature is inconstant it is not important from a diagnostic standpoint.

The anemia and cachexia may run a course corresponding with that of Hodgkin's disease, and the blood findings in neither are conclusive. Pressure symptoms may be present as in pseudoleukemia, but are not so likely to be pronounced, especially in the upper respiratory tract.

Contrasting the features of generalized lymphatic tuberculosis and pseudoleukemia, it does not appear surprising that their clinical differentiation may be difficult. The temperature reaction of tuberculosis is unavailable because of the febrile state, except in apyretic cases. The skin reactions were not reliable in the case to be reported, as the patient was colored. Moreover, tuberculin reactions may be present in Hodgkin's disease in later stages or with many glands involved. Removal of a gland for microscopic examination may be the only means of definite information.

The case to be reported was observed in the writer's service at Cook County Hospital. His acknowledgments are due to Dr. Bisell, the pathologist, and Dr. Foutz, his senior interne, for interest shown in this connection.

The following is an abstract of the clinical history:—

Female, *æt.* thirty-one, colored. Housewife; widow; admitted May 5th, 1913, exhibiting general adenopathy, and complaining of pain in the abdomen.

History.—Sick for six months. Confined to bed for two weeks. First noticed enlarged glands six months ago. They have gradually increased in

size and are not painful. Pain in the abdomen began six months ago. It is not related to taking food, and may be relieved by food at times. Loss of weight about 30 lb.

Previous History.—Was operated on two years ago for pelvic trouble. Following this was never as well as usual. Family, marital and obstetric history otherwise negative. Positive history of gonorrhea. Doubtful history of syphilis.

Examination.—General adenopathy of anterior and posterior cervicals, submental, submaxillary, axillary, epitrochlear and inguinal glands. The glands varied from the size of a pea to a hen's egg, ovoid in form, regular in outline, smooth surface, firm consistency, discrete, not tender, and movable. Temperature on admission, 4 p. m., 99.2° F. Head negative. Neck as described. Chest, a few râles in apices. Heart, normal. Abdomen, tender over epigastrium. Liver, three fingerbreadths down. Pelvis, negative. Extremities, negative. Reflexes, negative. Urine, clear, amber, specific gravity 1015, acid negative. Blood: reds 2,490,000; whites 20,200; hemoglobin 70 per cent. Color index, 1.5+. Stained specimen: reds normal. Differential count: small mononuclear lymphocytes 16 per cent., large, 11 per cent.; indented nucleated, 1 per cent.; mononuclear (myelocyte) 1 per cent.; polymorphonuclears 70 per cent.

During the sixty-eight days in hospital the temperature ran a very irregular course, averaging from 99.5° to 101.5° F. On several occasions it was normal in the morning, and on three or four mornings subnormal. With the exception of the day of admission, when it reached 103° F., it was rarely above 102° F. It was subnormal a few hours before death with a sharp rise immediately preceding death. There were no apyretic periods.

June 2nd. A cervical gland removed for diagnosis showed evidences of tuberculosis.

June 16th. Examination of blood showed slight increase in reds, leucocytes 20,000; color index 1.

June 25th. Nodular masses could be palpated in abdomen, and the latter became tender, painful and distended. There was an area apparently of tumor mass in the mediastinum. Swelling of the left arm and leg occurred from pressure. Reflexes diminished. Weakness and stupor.

During first half of July patient complained of headache, increasing deafness, stiffness of neck, and exhibited Kernig's sign; diminished patellar reflexes, and increasing weakness and stupor. Spinal puncture showed fluid under pressure (150 mm. per minute) cloudy, positive. Noguchi test, leucocytes 200 per mm. with marked increase in small lymphocytes. No growth was obtained on culture. Death occurred July 18th.

At autopsy, two days after death, the following anatomic diagnosis was made.

Diffuse nodular, healed caseous and miliary tuberculosis of both lungs; caseous tuberculosis of the tracheobronchial lymph-nodes, bilateral bronchopneumonia; left obliterative fibrous pleuritis; extensive hypostatic hyperemia of the dependent portions of both lungs; hyperplastic lymphadenitis and periadenitis of the cervical, subclavian, axillary, tracheobronchial, retroperitoneal, mesenteric, iliac and inguinal lymph-nodes, without caseation except in the tracheobronchial glands; disseminated miliary and nodular tuberculosis of the liver and kidneys; acute tuberculous meningitis; cloudy swelling of the liver, kidneys and myocardium; hyperplasia

of the spleen; partial pressure obliteration of the inferior vena cava by the hyperplasia of the retroperitoneal lymph-glands; edema of the lower extremities; passive hyperemia of the stomach and intestine; cyst of the left ovary; tumor of the right breast; sclerosis of the coronary arteries; fibrous adhesions between the appendix and the peritoneum over the common iliac vein; emaciation; hypodermic needle puncture wounds of both arms; missing teeth.

At the time of this examination, no softening was noted in any of the enlarged glands. The enlargement was uniform and symmetrical, and the regional lymph-nodes were firmly adherent to one another. The section of these glands was similar throughout, except in the case of the tracheobronchial nodes, a pearly, glistening transparent tissue.

Microscopically, the picture is the same throughout—great increase in fibrous tissue with extensive hyaline degeneration, foci of caseation and numerous tuberculous giant cells.

There was no proliferation of endothelium whatever as we would expect to find in lymphatic tuberculosis of the Sternberg type. This particular type of tuberculosis is sufficiently common in negroes that it offers no unique pictures other than those met clinically.

This case is not presented as one simulating the Sternberg type of lymphatic tuberculosis except in its clinical features. Clinicians sometimes allow themselves to become strongly impressed with the gross topographical features of lymphatic tumors resembling those of Hodgkin's disease. In a recent case, which might have warranted such impressions, an examination of the histological character of the growth proved it to be tubercular in spite of its close resemblance to Hodgkin's disease. The point is that examination of the character of the tumor in some cases is the only way of making a correct diagnosis; and if the recent investigations as to the definite pathology and infectious nature of Hodgkin's disease are sustained, an early diagnosis by such means becomes all the more important.

RETROCECAL APPENDICITIS.

By D. W. BASHAM, M. D., of Wichita, Kan.

Retrocecal appendicitis has reference to the cases in which the vermiform process occupies a position posterior to the head of the cecum. The situation of the appendix vermiformis in these unusual if not abnormal positions is extremely variable. In fact, it would be difficult to find two cases combining like features in every particular. Consequently it would be difficult to classify the various forms of retrocecal appendicitis in such a manner as to facilitate our study and understanding of the malady.

Any attempt at classification of irregular conditions of disease, unless there are sufficient points in common with the different varieties, leads to confusion rather than elucidation of the subject. Nevertheless, there are as many as three different varieties of retrocecal appendicitis met with often enough to justify such a classification; but it is doubtful if our understanding of the condition is in any way made easier thereby.

The most rational classification has reference to the anatomical situation of the appendix. There are three principal locations where the retrocecal appendix is most often found. The three most frequent locations of the retrocecal appendix are (1) external and posterior to the cecum within the peritoneal cavity and with the distal end of the appendix directed upward; (2) the appendix lies directly posterior to the head of the cecum; and (3) the appendix is situated posterior and external to the cecum and at the same time extraperitoneally.

As the surrounding viscera and other anatomical structures govern to a very considerable extent the natural course of the disease, it follows then that the subject is best considered from the standpoint of the anatomical location of the appendix. For example, if the vermiform appendix in its ordinary situation becomes infected and goes on to abscess formation, the omentum, posterior peritoneum, head of the cecum and juxtaposed coils of ilium approach each other round about the diseased organ, become agglutinated, and determine the limitations of the abscess. If through anaplexis the infected part is not fortified by the walling-in process just described, the cavum peritonei rapidly fills with a milky fluid which, if not evacuated, very soon becomes purulent, gives rise to general peritonitis, and results in the death of the patient.

Appendicitis in any of these three locations is greatly modified

by the surrounding structures. In the beginning of the attack the pain will be reflected along the nerves pressed upon. If the case goes on to suppuration, the abscess will project in the direction of least resistance. Inflammation of the appendix situated posterior and external to the cecum and within the peritoneal cavity is to be differentiated from empyema of the gall-bladder, pyonephrosis, cystic kidney, hypernephroma, incarcerated stone in the upper part of the ureter, malignant neoplasm of the cecum. The leucocyte count helps us but little in differentiating an appendiceal abscess from an abscess in the kidney or gall-bladder.

In this form of appendicitis the mass is situated external to the cecum and just internal to the anterior superior spinous process of the ilium, and extends upward, often filling the hiatus ilio costalis. Thus the mass lies in front of the kidney. If suppuration is present and the abscess is at all extensive it may be extremely difficult to know whether we have to do with the appendix, the kidney, or an abscess of the perinephritic space. The urine should be examined for pus, blood, bile, and especially albumin. It must be remembered that, as first noted by Dieulafoy, the urine of patients with acute appendicitis very often contains albumin.

There is a difference to be noted in a mass or an abscess of the post-cecally situated appendix and the same conditions in the kidney. If the tips of one or two fingers of the left hand be placed in the costovertebral angle of the twelfth rib and the palmar surface of the fingers of the right hand be made to circumscribe the inner border of the abscess—if it come from the appendix it will be found to arise from the region of the head of the cecum, and if it come from the kidney its most prominent part will be directly inward to a point somewhat above the umbilicus.

Appendicitis in the retrocecal extraperitoneal location of the appendix is likely to be mistaken for stone in the kidney, renal abscess from any cause, or some pathological condition of the gall-bladder. The most common form of retrocecal appendicitis is the variety where the appendix is situated posterior and external to the head of the cecum and within the peritoneum. The appendix may be situated anywhere in the space between the under surface of the liver and iliac fossa. There is usually a good deal of pericolic membrane in connection with these abnormal forms of appendicitis. This variety of appendicitis is indeed much more frequently met with than is commonly supposed. As a rule the appendices in this location are very long, whether they are inflamed or not. They are for this reason dragged upon by the cecum, which probably accounts for the abnormal length of the organ in this location. The writer has thought that the appendix in this location, between the os innominata and the colon, is subject to traumatism from pressure, especially when the colon is distended.

The diagnosis of appendicitis in these abnormal locations is beset with some difficulty. There is generally no pain over McBurney's point excepting that which arises from any intraperitoneal inflammatory process. There is generally no marked rigidity of the right rectus. Acceleration of the pulse-rate, elevation of temperature, and vomiting are present as often as in ordinary appendicitis. The presence of an abscess does not always make the diagnosis easy, for the mass is situated on the posterior wall of the peritoneum or otherwise to the outer side of the cecum instead of just beneath the anterior wall of the abdomen. There is, therefore, resonance on percussion over the diseased area instead of dulness. Instead of muscular rigidity limited to the right rectus there is usually a sensitiveness of the whole right side of the abdomen. If there is an abscess of the appendix situated external to the cecum, it is situated just internal to the anterior superior spinous process and extends backward and upward into the iliocostal space. Of course, a painful inflammatory condition, whether accompanied by tumefaction or not, in this location should make one think of the possibility of a renal affection or a gall-bladder trouble as well as appendicitis. The leucocyte count cannot always help us here, for both renal abscess and empyema of the gall-bladder give rise to leucocytosis.

Postcecal appendicitis with the appendicular mass situated directly behind the cecum may be mistaken for a neoplasm in the head of the cecum or obstruction of the bowels from some other cause. Here the leucocyte count may be accepted for its full value as a differential point. Appendicitis in an appendix located behind the head of the cecum and perforce also just behind the terminal portion of the ilium and Bauhin's valve causes obstruction of the bowels which is relieved by timely operation. This form of appendicitis often causes the pain to be reflected outward over the hip and upper part of the thigh along the course and distribution of the lumbar nerves pressed upon as they cross the psoas muscle. It may be observed that the superficial veins of the right side are usually full and more prominent than on the other side. As first pointed out by Dieulafoy, there is usually albuminuria in this sort of appendicitis. In the chronic nonsuppurative form of postcecal appendicitis it may be very difficult to know whether we are about to deal with a gall-bladder lesion or a diseased appendix. The writer thinks that in this situation it is well to place the incision so that both the appendix and the gall-bladder are accessible. The verisimilitude of renal abscess and the abscess of a postcecal appendix is not imaginary, and this sometimes places the operator in an unpleasant situation, especially if some of the patient's relatives insist upon being present at the operation. Here we cannot avail ourselves of the accommodating incision as in dealing with the gall-bladder and the appendix at the same time. This might be

feasible in the absence of suppuration or extensive adhesions about the appendix.

In résumé of the subject of diagnosis of postcecal appendicitis, it is well to mention the conditions which may be mistaken for this disease. It must be remembered that, at least in Kansas, we usually see these cases after suppuration has taken place. We must therefore bear in mind the possibility of stone in the kidney, abscess of the kidney from any cause, stone in the ureter, tumors of the lower pole of the kidney, affections of the gall-bladder, obstruction of the bowel, especially in the presence of a neoplasm of the cecum or ascending colon.

In the operative therapy of these irregular forms of appendicitis it is well to place the incision over the most prominent part of the tumor if there is a mass. If there is no tumefaction the incision should be made so as to give access to the iliocecal region and the ascending colon. This is no place for the gridiron nor in fact any of the transverse incisions. The drainage when necessary should be placed in a stab wound in the iliolumbar space. As before remarked, drainage is the rule in southern Kansas, for we rarely see the case until there is an abscess. Posterior drainage in these cases is far superior to the anterior, or drainage with the Fowler position. The appendix should always be removed in these cases if at all feasible without compromising the safety of the patient. If the appendix is not removed, drainage is usually prolonged for many weeks, and even then the appendix may have to be removed in the presence of pus. The pressure and disturbance about the cecum frequently lead to gangrenous perforation followed by fecal fistula. If the drainage is unobstructed, these fistulæ generally heal spontaneously.

THE CLINICAL ASPECTS OF RENAL INFECTION.

By DANIEL N. EISENDRATH, M. D., of Chicago.

The primary object of this paper is to call the attention of the general practitioner to some of the clinical pictures under which infection of the kidney appears. If we encounter in our daily life a person whose face is not characteristic enough to impress his or her features upon our memory of faces and who at the same time changes garments frequently so as to render identification still more confusing, we are puzzled as to whether we are sure of his identity every time we meet him. This comparison is not an exaggeration.

In the hyperacute and even in many of the acute and chronic cases of renal infection, the local signs are often completely masked by the general symptoms of septic intoxication or by the even more common fact of the patient's referring all the symptoms to the bladder; and thus those who do not know some of the multicolored garments under which renal infection disguises itself are apt to overlook the golden period at which the kidney itself, the real seat of the trouble, might receive aid and thus avert either complete destruction of the organ of one side, or prevent the spread of the infection to the other. The writer has frequently seen the opportunity to give relief to one kidney slip by, while the diagnosis was either in the process of formation or the danger of an ascending infection of the opposite ureter and kidney not fully appreciated. When this latter condition takes place, the patient is already so septic that no treatment is of avail.

In order to understand the clinical symptoms and the various therapeutic measures employed in the treatment of renal infection, a most thorough knowledge of the bacteriology and various pathological changes is absolutely essential. In a paper of this length it will be possible to give only a bird's-eye view so that the landscape will not be unfamiliar when encountered clinically. The micro-organisms which cause renal infection enter the kidney in several different ways, and it is almost impossible, especially in advanced cases, for either pathologist or clinician to state which route was followed. Personally, the writer does not lay much stress in renal infection upon whether the blood, that is, hematogenous, or ascending, improperly called, as the writer will show, or whether the urogenous route was the avenue along which the organisms reached the kidney. We are accustomed, however, to speak of a hematogenous or descending invasion, the blood current acting as the route of travel for the organisms, and an ascending invasion,

the urinary current in the ureter acting as the medium to convey the organisms from the lower to the upper urinary tract. In tuberculosis of the kidney, the hematogenous route is the mode of entrance of the organism in 90 per cent. of the cases, but in ordinary renal infection the proportion is much smaller because here the ascending route plays a more important part.

The writer does not wish in the least to minimize the immensely important rôle which the blood route plays in renal infection, as the demonstration of this mode of invasion has made it easy for us to recognize and operate upon many of these cases when they were still limited to one kidney. The former explanation that organisms proceed upwards along the mucous membrane of the ureter from the bladder to the kidney is beginning to be questioned. It has never seemed a reasonable theory that organisms migrate upwards against a current as strong as the urinary stream is, except when almost complete stagnation exists, and one must look for another explanation in cases where but slight, if any, obstruction is present. We will shortly report some observations made on the human and animal ureter, which the writer believes will greatly change existing views. His work is based on the fact that the bladder and kidney are intimately connected by the lymphatics within the wall of the ureter, and that this is the favorite route for organisms to travel from the lower to the upper urinary tract. Recent work of Franke and others has also shown that the ascending colon surely, and the descending colon in all probability, are directly connected by lymphatics with the right and left kidneys respectively. Some writers attempt to ascribe many cases of renal infection, especially in children, to such a close relation between the alimentary and urinary tracts. In the absence of any proved clinical cases, it is well to suspend judgment for the present. The same is true regarding transmission of infection from the female genitalia to the ureter and kidney. For practical purposes the knowledge of the hematogenous and ascending (intraureteral and intramural) modes of invasion suffices. In the majority of cases the infection is present in the early stages, at least, only in one kidney, and the knowledge of this fact is of the utmost importance in the treatment, since conservative measures may often be employed which will limit the process to one kidney or, on the other hand, the golden opportunity of giving relief slip by, because the clinician thought that both kidneys were invaded from the beginning. Clinically, and in a pathological sense, both the ascending and descending modes of invasion give rise to almost the same pathological changes, the chief difference being that the renal pelvis shows greater changes in the early stages of ascending invasion. Under normal conditions the sphincteric action of the lower end of the ureter prevents an ascending infection, but when the ureteral orifice is ulcerated or the

ureter rigid as the result of the disease, such a closure is impossible. The general impression of an incompetent sphincter under ordinary inflammatory conditions will, the writer feels confident, yield to the lymphatic mode of ascent in the majority of cases. Any condition which produces obstruction either to the lymphatic or urinary stream favors infection of the ureter and kidney, and one should always search for such an obstruction. The necessity of a routine x-ray examination in all renal infections is emphasized by such cases as I (No. 950) and II (No. 956), quoted later. As in the gall-bladder, the moment an obstruction or cause of stagnation is removed, conditions return to a quiescent stage, but quickly recur under similar favorable conditions. Many cases are no doubt due to congenital conditions like valves or stenoses of the ureter, and a hydronephrosis may remain latent and unsuspected until infection occurs, as in Cases VII (No. 504) and IX (No. 754), quoted below. At times the general septic intoxication or bacteriemia is so intense that it entirely obscures the fact that the kidney is the seat of the trouble. This is especially true of hyperacute and less acute cases of hematogenous unilateral infection, and the knowledge that these pathological conditions exist may be of great value in saving such patients. In nearly 90 per cent. of cases the organism involved is the *B. coli*; of the remaining 10 per cent. the ordinary pyogenic cocci and the urea-decomposing organisms form the majority.

There is no specific clinical picture for any of these organisms, at least in the beginning, and we can only differentiate by means of cultural tests. That a chronic infection with any one of the above organisms is a menace to the kidney is well shown by Case X (No. 765) and the case in group 6 (in which calculi reform constantly in spite of operation). Mixed infections of several pyogenic organisms are common, yet little attention has been paid to cases of mixed pyogenic and tuberculous infection, such as Cases XV (No. 952) and XVI (No. 227), quoted below, where the underlying tuberculous nature of the cases was obscured by the pyogenic infection.

PATHOLOGY.

Infection in the kidney may result in a number of different anatomical changes, and the more chronic and recurrent the infection, the more likelihood is there of advanced pathological findings. The fact that the process is at first unilateral and later invades the opposite kidney is the best incentive toward early and thorough treatment.

In the hematogenous infections there is one form where miliary abscesses or small septic infarcts are scattered throughout one kidney, while in the other form a single or several larger furuncle-

like foci of suppuration exist, and may invade the perinephritic tissues at an early stage, as in Case V (No. 1,078). In the ascending infections, the pelvis is primarily involved, and all the forms of inflammation incident to any mucous membrane may be found, such as serofibrinous, purulent, diphtheritic and gangrenous changes. The term pyelitis is a clinical one, since in most of the cases the parenchyma is more or less involved, the lymphatic connection between the two being a most intimate one. The invasion of the kidney takes place chiefly along the lymphatics running from the papillæ to the capsule and forming a network around the tubules and blood-vessels, as Kumita has shown.

It will thus be seen that a pyelonephritis, although not always recognizable clinically, is no doubt present at an early stage. Later on the persistence of fever and the local signs (tenderness and enlargement of the kidney) can be readily explained by the familiar picture of such pyelonephritic kidneys, the yellow streaks extending from the apices of the papillæ toward the cortex and the miliary and larger abscesses scattered throughout the cortex and medulla, often seen as groups of abscesses on the outer surface of the kidney. From these changes to a complete disintegration of the parenchyma with the formation of larger or smaller pus sacs (pyonephrosis) is but a short step. There is one sequel of infection which is not so clearly understood by many surgeons—namely, the infected hydronephrotic kidney, the result of some form of obstruction at the outlet of the renal pelvis or lower down. Such kidneys, as in Case VII (No. 504), never give rise to serious symptoms until infection occurs. The parenchyma gradually yields by atrophy to the pressure within the renal pelvis. When infection takes place, the pelvis, even though greatly dilated, offers resistance to the organisms for a long period. The practical value of this is that even though infection has occurred in such kidneys, a conservative method of treatment is often indicated, since much good functioning parenchyma still exists and recovery is possible if obstruction can be removed and the infection brought under control. The invasion of the perinephritic tissues, either by way of the lymphatics or by direct contiguity with a focus in the cortex, is readily understood, the symptoms of such perinephritic infection not infrequently, as in Cases I (No. 950) or V (No. 1,078), completely overshadowing the renal infection, and often simulating other acute abdominal conditions.

CLINICAL PICTURES.

As stated in the beginning of this paper, the writer can only call attention to a few of the many clinical pictures under which renal infection appears, and discuss the value of various diagnostic aids and methods of treatment in connection with the report of each case.

CASE I, No. 950.—Acute pyelonephritis complicating ureteral calculus; nephrectomy; recovery. History of gonorrhea fifteen years before admission to the writer's service in the Michael Reese Hospital. Prostatic abscess opened fifteen months previous to present illness. Onset of latter very sudden, three days before admission on September 17th, 1912. First symptom was severe clamp-like pain in left lumbar region, which radiated to testes of same side. Has had four chills since first attack of pain, each followed by fever and sweat. No increased frequency or painful urination. Urine contained many pus cells and a few red cells.

Upon examination there was no tenderness to be found either over lumbar or iliac regions. Especially noticeable that there was no tenderness over left renal region.

During first day after admission to hospital, temperature rose suddenly from 99 to 105.8° F., preceded by a chill. No radiograph taken before operation, as the case was thought to be one of pure renal infection.

Kidney exposed on second day after admission. Perinephritic tissues markedly edematous. Entire cortex studded with dark blue areas, varying in size from a pinhead to a dime. On section of kidney these dark areas are seen to be the base of hemorrhagic infarcts extending down to the medulla. Many

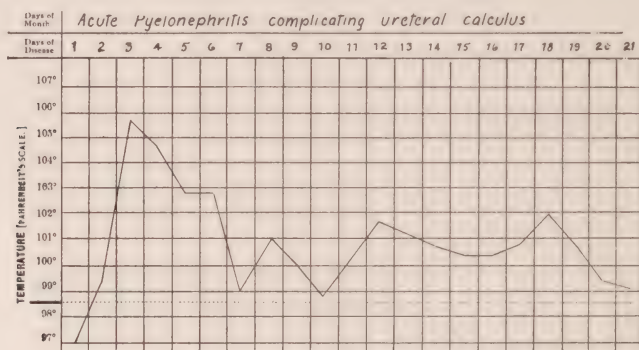


Fig. 1.—Case I (950).

of the smaller ones showed a yellowish pus centre. Pelvis of kidney filled with large amount of turbid fetid urine and ureter greatly thickened, intensely red and edematous. Calculus, about size of pea, freely movable. Kidney removed.

The temperature dropped gradually after nephrectomy, and patient made an uneventful recovery.

Remarks.—This case illustrates an acute infection of the kidney parenchyma causing extreme sepsis, and necessitating radical measures. The presence of a calculus in the upper third of the ureter leads one to believe that the infection was of the ascending rather than of the hematogenous type. This calculus had the characteristics of a so-called wandering calculus—namely, that it could be readily moved up and down within the dilated ureter, thus accounting for the difficulty with which such calculi are often found during operation. The reason for performing nephrectomy was on account of the ample evidences which the exposed kidney showed of an acute infection with multiple miliary foci of suppuration

scattered throughout the cortex and medulla, as well as the many septic hemorrhagic infarcts. Clinically, an interesting feature was the sudden onset of this septic condition fifteen months after an abscess of the prostate, possibly of gonorrheal origin, had been opened. The only localizing sign pointing to the kidney as the cause of his high temperature (Fig. 1) was renal colic, which was not due to the ureteral calculus, on account of the extreme mobility of the latter. This is an example of the renal colics which are well shown in Cases IV and VI (No. 117), in which the infection gives rise, even without the presence of calculi, to typical renal colic attacks. We are accustomed to think of such a symptom as being pathognomonic of ureteral calculi only. We now know that many other conditions, such as renal or ureteral infection, essential hematuria, chronic nephritis, neoplasms, tabes, and the so-called oxalate and uric acid showers, will cause colics which cannot be distinguished in any way from those due to calculi. The history of

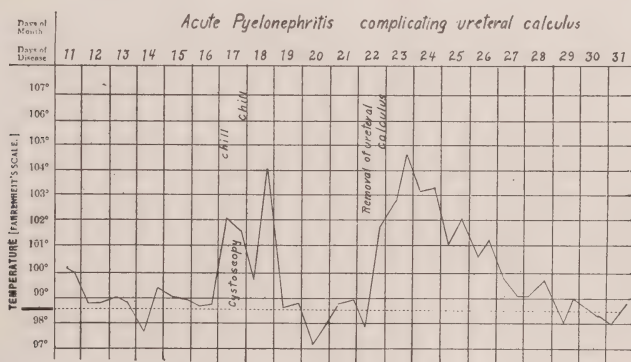


Fig. 2.—Case II (956).

repeated chills followed by fever and sweats prior to the patient's admission to the hospital, with but few local signs, shows how easy it is for such cases to be mistaken for malaria. The absence of periodicity in the chills and the absence of plasmodia in the blood would aid in differentiating such a renal infection from other causes of repeated chills and fever, like malaria or the so-called intermittent hepatic fever of Charcot, due to a cholangitis.

CASE II, No. 956.—Acute pyelonephritis, complicating ureteral calculus. Removal of calculus; subsidence of septic symptoms; recovery.

History.—Patient perfectly well until ten day before admission. No history of previous attacks. Had sudden severe pain in left lumbar region, intermittent in character, radiating to left testis. Has had frequent attacks of chills and fever since onset of illness, also night sweats. Temperature during first four days' stay in hospital was only slightly above normal, but following a cystoscopy, during which resistance was met in the left ureter, about one and one-half inches from bladder, the temperature rose to 104° F., and then dropped to normal. Following removal of calculus temperature rose and remained quite

high for four days, then gradually falling to normal. Patient made an uneventful recovery.

Radiographic examination showed a small calculus evidently in lower end of pelvic ureter. This was removed and found to be tightly wedged in the intraparietal portion of the pelvic ureter. Ureteral mucosa intensely red, and evidences of a recent inflammation; walls of ureter thickened and ureter larger than normal.

Remarks.—This is an example of conservatism in septic infection of the kidney. Aside from the severe pain in the left lumbar region, radiating to the left testis, there was nothing in the history or the physical examination to indicate the presence of a calculus. His temperature at first was normal, but, as is not infrequent in cases of impacted ureteral calculus, it rose rapidly and was preceded by chills as soon as a cystoscopy was performed. The suspicion of the presence of a ureteral calculus was only by indirect signs, and the necessity of routine x-ray examination of the urinary tract in every case of renal infection is well shown in this patient. The radiograph showed a small calculus lodged very tightly within the intraparietal portion of the pelvic ureter; that is, that portion which passes obliquely through the bladder wall. The removal of this calculus was followed by a cessation of the temperature and a rapid recovery from the septic condition of the kidney. The favorable result obtained in this case is not always similar to other cases. One finds at times that in spite of the removal of a calculus the temperature and septic condition of the kidney recurs, and one may even get an extension of the infection to the opposite side, as Case III (No. 545).

CASE III, No. 545.—Male, *æt.* thirty-five. Entered service of Dr. D. F. Monash on October 30th, 1910. One year before had an attack of sharp, cutting, colicky pain over region of a former appendix operation. Pain radiated back and up to lumbar region and later across to left kidney region. Forced to remain in bed two weeks on account of pain. Right side of abdomen became markedly swollen and hardened. Had had two similar attacks in July and September preceding first admission to hospital, and one week before admission noticed a sharp twinge in right inguinal region, radiating up and back to right kidney, but continued to work until several days before coming to hospital. One week before admission he noticed a sharp twinge in right inguinal region, radiating up and back to right kidney, but continued to work until several days before coming to hospital, when he had an attack of chills and fever and with difficulty obtained an action of the bowels (reflex ileus). Since this time also had frequent urination and burning when he urinated. Never passed blood or gravel. Family and past histories negative.

On admission, examination showed slight rigidity and diffuse tenderness from costal arch to iliac region on right side of abdomen. On November 7th, 1910, Drs. Monash and Eisendrath operating, an incision was made to expose the right kidney, and a small stone was felt in the upper portion of the ureter, tightly impacted. The ureteral lumen was dilated and the walls thickened where the stone was lodged, and a small collection of pus was present as a periureteral abscess. Surface of kidney nodulated and intensely congested, with a few miliary abscesses scattered about on cortex.

The removal of the kidney was considered, but deemed unnecessary. Gradual drop in temperature and recovery. Discharged as cured November 26th, 1910. Urine contained much pus and numerous casts before operation. On November 9th, only a few pus cells and no casts. Temperature curve is shown in Fig. 3. White blood cells 10,800 on entrance.

Readmitted December 15th, 1910, three weeks after discharge from hospital. A few days before this readmission suddenly taken with severe sharp pain over left kidney, radiating to front and down to region of bladder. This pain was accompanied by a daily chill. Present pain was accompanied by a daily chill. Present pain not as severe as that due to calculus pain of right side. Extreme tenderness both in front and back over left kidney, but no tumor palpated. Also tender over left ureter. Temperature remained of septic type with metastases until death.

Remarks.—In this case there was a distinct history of renal colic, evidently due to calculus, but the clinical picture of calculus was obscured by that of infection. Both conditions seemed to be present before the first operation on the right side only, as the patient did not show any radiographic shadows on the left side, but there

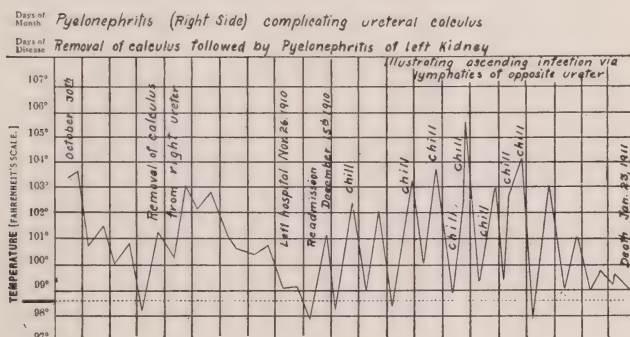


Fig. 3.—Case III (545).

was a distinct one on the right side. There were also no evidences of infection before the first operation on the left side. The condition in which the calculus was found was that of firm impaction in the upper portion of the ureter, with the formation of an abscess in the tissues immediately adjacent to the ureter and just below the outlet of the renal pelvis. The conservative operation pursued in this case seemed justified in spite of finding the kidney in a septic condition at the time of the operation. It was thought best to attempt to save the kidney after removal of the calculus. The further history of the case is well shown by the study of the temperature chart. It is always difficult to judge at the time of operation whether one should save the kidney after removal of a calculus of the ureter which has blocked and thus caused infection of the kidney. It is always worth a trial if the exposure of the kidney shows only a moderate number of abscesses, as many such kidneys will recover, as for example in Case II (No. 956). In Case III, however,

the conservative operation was followed by an ascending infection of the left opposite kidney, the patient leaving the hospital with a slight temperature, and being readmitted about ten days later, with recurrent chills, high temperature and pain over the left opposite kidney, evidently due to ascending infection from the right side. The patient became more and more septic, until he finally succumbed to the generalized bacterial infection.

CASE IV.—Acute hematogenous pyelonephritis; principal symptom renal colic. Patient entered the writer's service May 9th, 1910. She was seventeen years of age, and single. Four days before admission to hospital was suddenly seized with severe pain over left kidney, radiating to left thigh. Onset of illness preceded by chill. Gave a history of similar attack four years previously. X-ray examination was negative.

Examination.—There was distinct tenderness over left kidney and along left ureter. Urine contained a number of pus corpuscles. Cystoscopic examination showed only a slight inflammation at base of bladder.

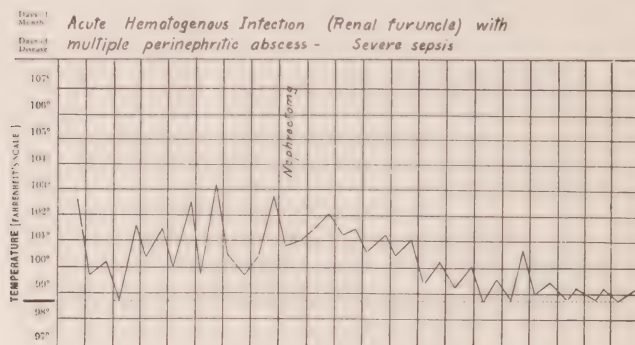


Fig. 4.—Case V. (1078).

Remarks.—This case is quoted to show that renal colic and lumbar pain are often the chief symptoms of infection of the kidney.

CASE V, No. 1,078.—Acute pyelonephritis with multiple perinephritic abscesses.

Patient had been ill about twenty-one days before admission to hospital, although symptoms of cystitis had existed for a number of years. Pain seemed to start in right hypochondriac region and seemed to radiate downward and backward. Also had constant full pain over right kidney. Diagnosis had been previously made of gall-stones. During the week previous to admission to hospital had four chills. Upon examination there was distinct rigidity and tenderness just below right costal arch and a tumor mass could be distinctly felt extending from the outer edge of right rectus muscle, extending outward to kidney region. Her temperature during first week rose to 103° F., almost every evening, and dropped each morning. The white blood count varied from 13,000 to 18,000.

Cystoscopic examination showed a moderate degree of cystitis and a good functioning left kidney.

The kidney was exposed after temperature had been continuously high for several days. There was a large number of abscesses scattered about in the perirenal fat, each containing about an ounce of thick greenish, non-odorous

pus. The kidney itself was not greatly enlarged, but one could see quite a large pus focus about the middle of its convexity, and removal was deemed advisable.

About the middle of the cortex was an area which showed on section a wedge-shaped collection of miliary and pea-sized abscesses, extending from the convexity to the pelvis of the kidney. The remainder of the kidney showed no macroscopic changes. The localization of the process in a small area of multiple perinephritic foci led to the belief that the case was one of hematogenous origin, the primary atrium being unknown. Temperature dropped to normal gradually within first week, and remained so.

Remarks.—This case is of considerable interest on account of the obscurity in diagnosis, having been seen by an experienced internist, who diagnosed the case as one of gall-stones and in all probability complicated by an empyema of the gall-bladder. The patient's pain was referred chiefly to the right hypochondriac region, and one could feel indistinctly a mass just below the right costal arch. After subsidence of the more acute symptoms this

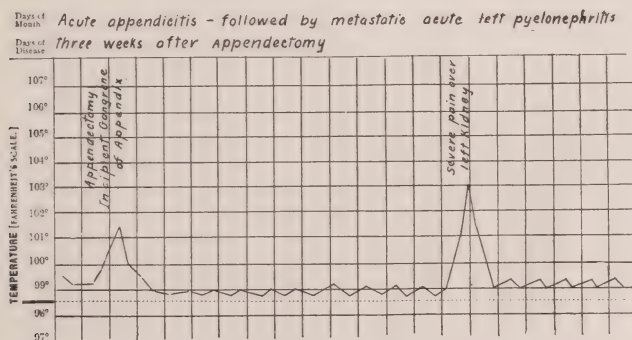


Fig. 5.—Case VI (117).

mass could be traced backwards toward the right renal region, and was thought to be an enlarged kidney. The infection was evidently of the ascending type, on account of the previous existence of a cystitis. The examination of the kidney, however, made this assumption slightly dubious, inasmuch as the cortex showed a distinct wedge-shaped furuncle-like focus of suppuration, which extended from the medulla to the capsule of the kidney, and was about the width of the adult thumb. The infection in the form of multiple abscesses of the perinephritic fat evidently had come from this parenchymatous furunculous-like lesion, so that the case may equally as well be thought of as due to a hematogenous infection. A conservative operation was out of the question, although before operation the entire mass had been construed as due to a probable pyonephrosis. The surprise was great on finding at operation that the major portion of the mass was composed of greatly indurated and edematous perinephritic fat, riddled with abscesses, and that the kidney itself was but slightly larger than normal. It was not

until the kidney was opened that the localization of the infection to a comparatively small portion of the cortex was noted. A conservative operation would, however, have been out of the question in view of the continued reinfection from the kidney. The temperature dropped promptly after removal of the kidney, and the patient made an uneventful recovery. This again emphasizes the necessity of examining the urinary organs in all cases in which temperature and septic symptoms are present, and to include this fact in the differential diagnosis of other intra-abdominal lesions.

CASE VI, No. 117.—Acute left-sided pyelonephritis three weeks after appendectomy. Patient was operated upon for an acute gangrenous appendicitis on July 15th, 1906, and made an uneventful recovery until twelve days after operation, when he complained of severe pain in the left side of the abdomen, especially over the left ureter, accompanied by rise of temperature to 103° F., lasting twenty-four hours. Urine contained red blood cells. There was distinct tenderness along line of left ureter. Temperature continued for about fifteen days.

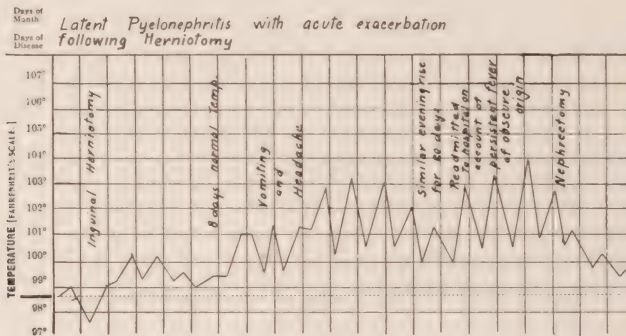


Fig. 6.—Case VII (504).

Remarks.—This case is of chief interest in relation to the metastatic hematogenous infection following a gangrenous appendix operation. The patient was apparently well for three weeks following the primary operation (removal of a gangrenous appendix without drainage). Suddenly he was seized with typical left-sided renal colic, and a rise of temperature, which subsided very rapidly after the administration of urinary antiseptics, diluents and the administration of alkaline waters. The metastatic infection in this case can readily be compared to a similar condition in the form of a thrombophlebitis occurring after even clean appendectomies on the side opposite to that of the operation. Examination of the urine showed red corpuscles, and tenderness along the line of the left ureter, which permitted no doubt in regard to the diagnosis of a pyelonephritis.

The treatment pursued in this case is typical of the average conservative treatment. This consists in keeping the patient at rest in bed with possibly hot applications over the region of the kidney,

the administration of large quantities of fluids, especially alkaline waters, and of urinary antiseptics, such as urotropin, which can be given in large doses, from 30-60 gr. daily. In some cases, when the infection does not yield to this medicinal treatment, one can add to it a lavage of the renal pelvis, with a small quantity of aluminum acetate, or 1 per cent. nitrate of silver solution.

CASE VII, No. 504.—Chronic pyelonephritis complicating an old hydronephrosis (recurrence of acute pyelonephritis symptoms following herniotomy). Patient, a man of forty, suddenly developed a temperature of 101° F. on the twelfth day after a herniotomy (left inguinal hernia). The following evening temperature was only 99° F. After this it began to rise until the sixteenth day after operation, and for a number of days following was 103° F. in the evening. The herniotomy wound showed a small suppurative focus at its upper end, which was drained. But in spite of this, the temperature continued and patient was frequently nauseated and vomited at times. Urine contained a large number of pus cells. He left the hospital with a temperature of 101° F., the wound healed. A week later urine still contained a large number of pus cells and temperature was 101° F. He complained of frequent and painful urination.

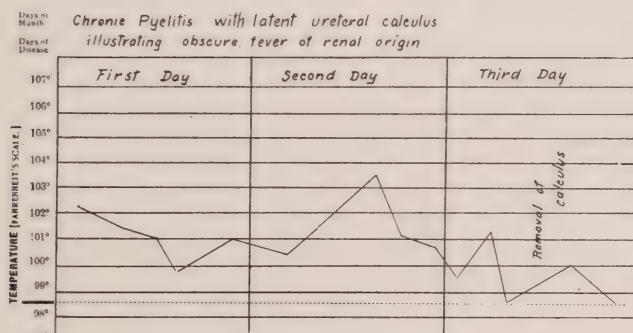


Fig. 7.—Case VIII (269).

Ureteral catheterization showed that the urine from the left kidney contained a large number of pus corpuscles and Gram-negative short bacilli in large numbers. The right was negative.

Examination showed the left kidney distinctly palpable and lower pole at level of umbilicus. Temperature rose to 104° F. and persisted high for three days. Diagnosis of pyelonephritis was made. Operation five days after second admission to hospital, six weeks after herniotomy. Kidney was greatly enlarged and quite extensively adherent; numerous miliary abscesses on cortex, surrounded by hyperemic zones. Nephrectomy performed.

Sections of kidney showed typical pyelonephritis complicating a hydronephrosis of long standing, due to a congenital narrowing of the ureter at outlet of pelvis.

CASE VIII, No. 269.—Chronic pyelonephritis with ureteral calculus; obscure fever of renal origin. Male, *æt.* fifty, was seen on August 18th, 1909, on account of a post-operative hernia following an acute appendix removal six months previously. Upon admission to the writer's service in the Michael Reese Hospital, it was noted that the patient was pale and that his temperature was 102° F. Following his appendix operation he had post-operative chills and fever, and these had recurred at irregular intervals since that time, *i. e.*, for six months, the last one occurring on the night before the writer

saw him. A most painstaking search was made to find the source of these irregular chills and fever which had greatly exhausted the patient's strength. There was a moderate degree of leucocytosis (16,000). There were no local evidences of infection in the vicinity of the former operation scar. The blood examination for malaria and typhoid were negative. The possibility of the presence of a right subphrenic abscess following the appendiceal infection was thought of, but the local examination proved this diagnosis to be untenable. There was no tenderness over the kidneys or along the course of the ureters or base of the bladder. Here was a patient with persistent and recurrent chills and fever, without a single localizing sign. The urine contained a small amount of pus, but in the absence of other urinary symptoms little significance was at first ascribed to it, until we traced back his history for a number of years prior to the appendix operation. Facts were thus obtained which again emphasized the necessity of a detailed history of every obscure case. He told us that fourteen years before consulting the writer he had first noticed a very severe pain on the right side of the abdomen. Blood was found in his urine and a few days later he passed a calculus. A second attack occurred two years later; another two years after that second attack, each lasting from two to three days. These few data apparently bore no relation at

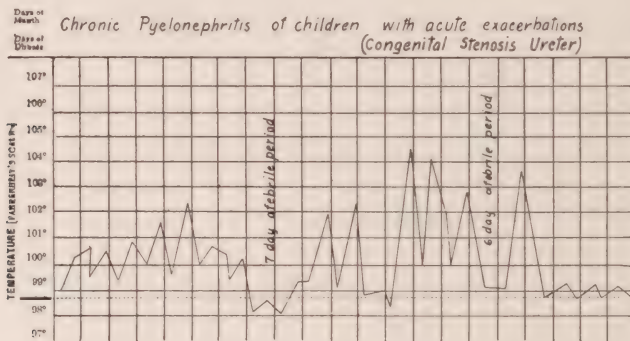


Fig. 8.—Case IX (754).

first to his present fever, because the last attack of renal colic had occurred ten years before. Even in the absence of any recent symptoms pointing to the kidney as the source of the present fever, an x-ray of the entire urinary tract was made and two shadows were found on the left side, one indicating a stone in the upper ureter and a second one in the kidney itself. With these shadows as a basis, the left kidney was exposed (after the hernia had been repaired), and a calculus, the size of a bean, found firmly impacted in the ureter just below the pelvis of the kidney. The second calculus was found loose in the renal pelvis. The post-operative course was uneventful. The temperature dropped to normal and remained so, and the patient gained rapidly in weight and strength. The most plausible explanation for his fever was that the presence of the calculus caused almost complete obstruction of the left ureter, with subsequent infection of the renal pelvis and parenchyma. The removal of the calculus permitted free escape of the previously stagnant urine. This patient has remained well since the date of operation, three years ago.

CASE IX, No. 754.—Acute exacerbation of chronic pyelonephritis. Girl, *æt.* sixteen, but with physical and mental development of child of six, was admitted to the service of Dr. I. A. Abt, in the Michael Reese Hospital. Her history was that of the sudden onset of severe pains in the abdomen, accompanied by frequent vomiting. This condition had lasted for about two weeks prior to

her admission. It was impossible to obtain any urine or to make a satisfactory abdominal examination until she was anesthetized. Upon inserting a catheter, a very large amount of turbid urine was evacuated and the greater part of the suprapubic enlargement disappeared. Our suspicion entertained before anesthesia, that the suprapubic enlargement was due to a greatly distended bladder; seemed at first to be confirmed. But in spite of suprapubic pressure, the catheter being left in the bladder, some enlargement remained, and the writer decided to open the abdomen in the median line and explore the peritoneal cavity. This was done and showed that both ureters were dilated, the left one far more so than the right. The left ureter could be seen to be about the dimension of the adult thumb. The corresponding (left) kidney was the size of the adult fist and markedly hydronephrotic. The right kidney was only slightly hydronephrotic. No cause for the obstruction in the left ureter was found proximal to the bladder. A diagnosis of cystiform protrusion of the lower end of a congenitally closed ureter was made, and a plastic operation begun, so as to create a permanent left ureteral opening into the bladder.

After this ureterostomy, on May 20th, 1911, and until June 20th, the temperature was practically normal, seldom rising as high as 100° F. Beginning June 20th, the temperature began to rise, reaching its first high point on June 26th (102.5° F.). From this date until July 20th, there were four febrile periods, with intervals of two to three days. The diagnosis of ascending infection (from the bladder) of the left kidney was made. An exploratory operation was decided upon. This was performed July 25th, 1911.

The kidney cortex showed a very large number of deep hemorrhagic spots, and at the upper pole there was a number of pin-point yellowish pus foci. Both these findings confirmed the diagnosis of pyelonephritis. The ureter was obstructed by a complete spiral twist of over 180°.

The kidney wound healed without complications. The patient, however, continued to look very pale, although passing a large quantity of urine, which, microscopically, showed a considerable number of pus corpuscles and traces of albumin. The microscopic examination of the tissue of the left kidney showed a high grade of leucocytes. Patient continued to feel well, being up and about, and was shown in the clinic a number of times. She was discharged from the hospital on October 15th, apparently greatly improved, but returned on October 21st, with symptoms of laryngeal stenosis and pulmonary edema, with resultant general anasarca, and died on October 25th, 1911.

The cases in this group are all examples of the sudden onset of febrile and other septic symptoms in cases of chronic infections of the renal pelvis (pyelitis), with or without macroscopic involvement of the parenchyma itself.

Remarks.—In Case VII congenital hydronephrosis had without any question existed for many years. The advanced degree of dilatation of the calyces proved this. The condition remained latent until infection supervened. Whether this infection was due to the catheterization subsequent to the herniotomy or to an old cystitis, it is impossible to say. The persistence of the temperature and the absence of any other cause for it led to a cystoscopic examination and ureteral catheterization, in order to find the source of the fever. A similar example of obscure fever of renal origin is shown in Cases VIII and IX. In the former, a patient, who first consulted the writer in regard to a hernia, was examined to ascertain the

cause of a persistent fever. There were absolutely no symptoms referable to the urinary tract, and only by accident did we learn that he had passed a calculus fifteen years before. This led to an x-ray of the kidneys and ureter, which revealed a calculus, whose shadow was almost indistinguishable from that of the twelfth rib. The calculus was found tightly impacted in the upper ureter, and was removed, followed by a prompt subsidence of the fever. In Case IX, a young girl with a congenital stenosis of the ureter, with a hydronephrosis of the corresponding kidney, showed no symptoms until infection occurred and caused a low grade of septic absorption, with acute exacerbations of fever.

CASE X, No. 765.—Acute pseudo-malarial febrile exacerbations of chronic pyelonephritis complicating latent calculus in pelvis. Female, *wt.* thirty-nine, was admitted to hospital for first time on July 23rd, 1910, complaining of chills and fever for preceding three days. On July 19th (four days before admission) she had a severe renal colic, radiating towards groin, but not ac-

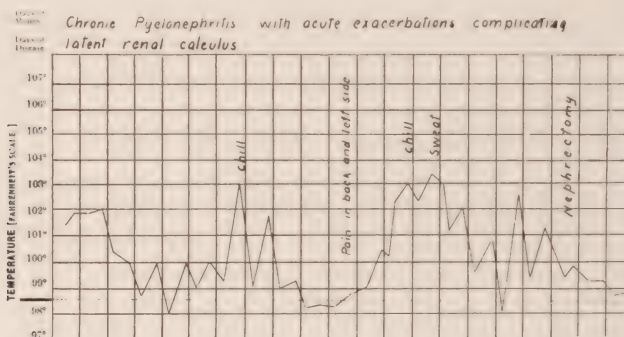


Fig. 9.—Case X (765).

companied by temperature. Also had slight pain in left lumbar region. No history of malaria, although she lives in Florida. No radiographic or cystoscopic examination made during her first stay in hospital. Evening temperature never rose above 100° F., and urine showed constantly large numbers of pus corpuscles. She was first seen with Dr. Ludwig Simon, on June 20th, 1911. She had been having fever during the preceding two weeks. When first seen by Dr. Simon she gave the history of having sudden pain in left lumbar region, which recurred six days later.

Temperature during these two weeks prior to admission was of a remittent type, rising to 103° F. in the evening, with afebrile intervals of several days' duration. There were no chills during this period.

Examination on admission showed some tenderness over left kidney. X-ray showed shadow about the size of a lima bean corresponding to position of left kidney.

Cystoscopic examination showed pus escaping only from left ureteral orifice; none from right. Temperature between time of admission, June 20th, and date of operation varied from normal to 103° F. Soon after admission she had a chill, followed by a temperature of 102 to 103° F., lasting two days. There was then a period of lesser degree of fever, 101 to 102° F., and nephrectomy was performed on June 29th.

Exterior of kidney, after stripping off capsule, showed a typical picture of a pyelonephritis. There was a large number of raised, dark-reddish areas scattered all over the cortex, extending down in a wedge-shaped manner towards the medulla. A dilated calyx close to the lower pole contained a calculus the size of a lima bean. Recovery uneventful.

Remarks.—This case illustrates how easily one can be influenced by the history of a person coming from a malarial region and having repeated chills and fever. The irregular manner in which the chills appeared, the absence of plasmodia and the left-sided renal colic led to the suspicion that an infection of the kidney was the cause of her septic symptoms. Her first attack yielded to conservative measures, but as is so frequently the case the symptoms of pain, chills and fever recurred, and led to an x-ray examination of the urinary tract. A stone shadow over the left kidney was found and the kidney exposed. The infection of the kidney was of so advanced a degree that its removal was indicated and resulted in

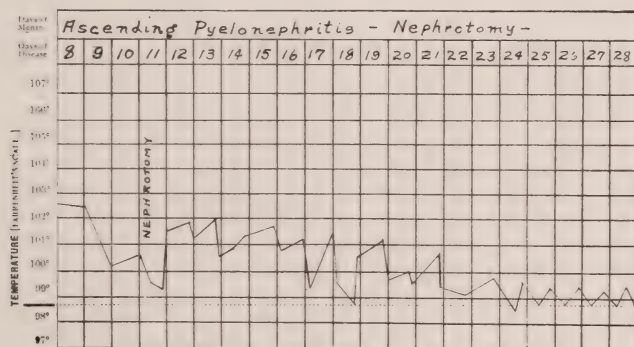


Fig. 10.—Case XI (469).

rapid recovery. The calculus was lodged in a dilated calyx of the lower pole and was in all probability secondary to the extensive renal infection (pyonephrosis). At least, its location was such that it did not obstruct the ureter at any time. If the kidney shows, as in this case, an advanced destruction, and the opposite kidney is able to take care of the work of both kidneys, as shown by examination of the urine obtained through the ureteral catheter, and the functional test (phenosulphonephthalein), it is best to do a primary nephrectomy. To operate and secondarily remove such a kidney, after having made an attempt to conserve it, is a much more serious step than a primary nephrectomy, on account of the dense adhesions which are almost always found at the second operation.

CASE XI, No. 469.—Ascending pyelonephritis; conservative operation. Patient had cystitis and pain in right side of abdomen and irregular temperature for preceding three months. The right kidney could be felt enlarged and tender. X-ray examination negative. Temperature on admission was 102.5° F., and continued to vary between 100 and 102° F.

The right kidney was explored and found to be the seat of advanced chronic pyelonephritis, the cortex being studded with multiple miliary foci of suppuration. The capsule of the kidney was stripped off, a number of miliary abscesses opened, and the kidney returned to its bed. The temperature continued, varied between 100 and 102° F., following this conservative operation, but eventually temperature dropped and patient left hospital in good condition, apparently recovered from her renal infection.

Remarks.—In the above case the diagnosis of an ascending infection was confirmed by inspection of the kidney. On account of the mild symptoms, a conservative nephrotomy was performed, and resulted in rapid recovery.

Group 3.—The third group of cases includes the pyelonephritis of pregnancy and of the puerperium. The etiology of these cases is not quite clear. According to some, the lighting up of an old cystitis or pyelitis during pregnancy or during the puerperium is the basis for the acute manifestations. According to others, and this has been proved by collargol injections of the ureter during

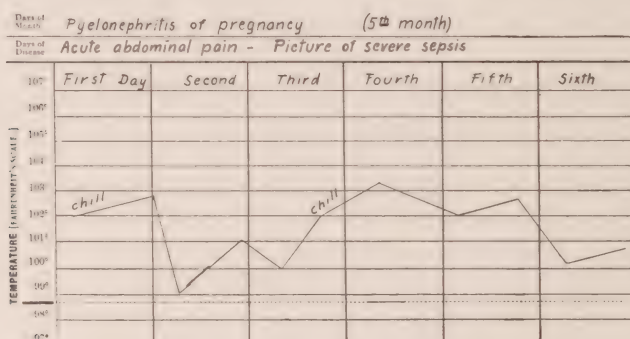


Fig. 11.—Case XII (529).

pregnancy, the right ureter is considerably more dilated than the left, and it is obstructed at the point where the ureter passes the iliac vessels. There is no question but that there is considerable foundation to both these theories. The condition is one that comes on very suddenly, usually from the fifth month onward during pregnancy, but it may appear even earlier. The clinical characteristics, both during pregnancy and during the puerperium, are practically the same as given in the following case.

CASE XII, No. 529.—Multipara, *æt.* twenty-five, five months' pregnant. Gave birth about a year before to twins, and at that time had no urinary symptoms. While visiting in a neighboring city, she was taken with severe chills, vomiting and fever. Her blood was examined for malarial parasites and found negative. A Widal examination made on several days also proved negative. The white blood count was 12,800. The history was that of repeated chills occurring at irregular intervals, followed by high fever and profuse perspiration. These symptoms had lasted for about one week before being seen by the writer. The examination revealed distinct pain over the right kidney and slight rigidity over the right rectus muscle. The diagnosis of appendicitis occurring during

pregnancy was made by several who saw her. The rigidity, as stated above, was only slightly marked anteriorly, and it was only by the history of repeated chills and fever, and the distinct evidence of tenderness over the right kidney, at the costovertebral angle, where it characteristically occurs, that led the writer to make a diagnosis of pyelonephritis of pregnancy. Her temperature (Fig. 11) was 102° F. upon admission, and rose rapidly after a chill to 103° F., and then dropped on the following morning and rose again in the afternoon, a chill occurring on the second day, and again at intervals after that time. The treatment consisted of vesical irrigations with 1-1000 nitrate of silver solution, which was begun on the fifth day after her admission to the hospital. She was also given urotropin internally, and large quantities of alkaline diuretics and large quantities of water. The temperature gradually declined and she was discharged from the hospital on the eleventh day.

Remarks.—This case is instructive in a number of respects. First, the occurrence of repeated chills and fever either during the pregnancy or even during the puerperium should always lead one to suspect the kidney as the basis of these symptoms. Not infrequently the local symptoms are comparatively slight. There may

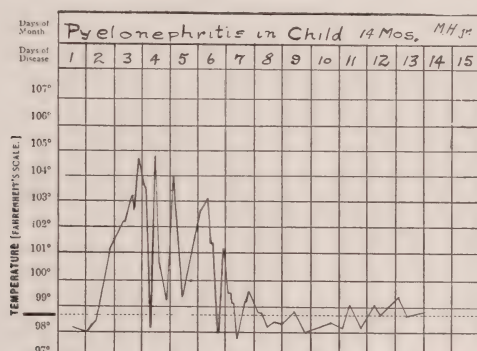


Fig. 12.—Case XIII.

be practically no tenderness over either kidney, although this is more characteristically present over the right than over the left. The urine, as in this case, shows usually a considerable number of pus corpuscles, but no casts. At times, especially when the stagnation in the ureter is marked, there may be practically no changes in the urine, even though the septic symptoms are very marked. The writer saw in consultation a case occurring during the third week of the puerperium of this latter character, in which the urine showed practically nothing except a few pus corpuscles; but the repeated chills and fever, the latter rising as high as 106° F., led one to suspect only by exclusion of other causes of sepsis, such as a local in the pelvis, that the condition was one of pyelonephritis, which yielded rapidly to the appropriate medical treatment. The latter is typical for all such cases, and the majority of them yield to such conservative measures, it being rarely necessary to interrupt the pregnancy on account of the pyelonephritis. This conservative

treatment consists in placing the patient at rest in bed, applying hot applications over the affected kidney, giving large quantities of alkaline waters and urinary antiseptics, a very bland diet, and keeping the bladder as clean as possible either by means of nitrate of silver or boric acid irrigations. The bladder is, in the majority of cases, the source of the ascending infection. If the condition does not yield to these measures it may be necessary to introduce a ureteral catheter into the renal pelvis and perform a pelvic lavage, and the best material for this purpose is a 1 per cent. nitrate of silver solution, of which a few drops are sufficient if left in the renal pelvis.

Group 4.—Group four includes those cases of infection of the renal pelvis and parenchyma which occur during infancy and childhood. These are extremely puzzling cases when met with clinically, the children being not infrequently treated for weeks or even months for endocarditis, influenza, enterocolitis, or a multitude of other conditions. It is only by a process of exclusion, as in the

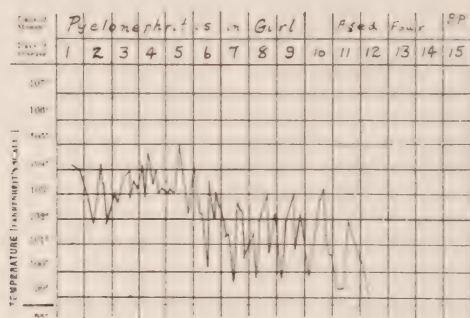


Fig. 13.—Case XIV.

other forms of renal infection, with but slight, if any, local symptoms, and by a careful examination of the urine that a diagnosis of this condition can be made. The writer is indebted to his colleague, Dr. I. A. Abt, of the Sarah Morris Hospital for Children, a portion of the Michael Reese Hospital, for the privilege of including the following 2 cases in this group of cases of renal infections.

CASE XIII.—Acute pyelonephritis in a baby, male, *æ*t. fourteen months. It was entered on account of an enterocolitis. While in the hospital the baby suddenly developed a temperature of 104.6 F. (Fig. 12), which fell again on the following morning to normal. But this rise recurred again the same evening to nearly 105 F., dropping again on the following morning as upon the previous occasion. This remittent type of temperature lasted for four days, and was gradual in its subsidence to normal. The urine was packed with leucocytes and the white blood count was 15,600. There were no local signs, such as tenderness, etc., over the kidney, and it was only by excluding other causes for this persistent temperature that the diagnosis could be made. The treatment given was that of urotropin in small doses, frequently repeated during the day, and the temperature yielded to this very rapidly.

CASE XIV.—Girl, *æt.* four, admitted to the service of Dr. Abt, with the history of having become suddenly restless, inactive, with loss of appetite, and the appearance of fever during the preceding three weeks. On the second day of her illness she became unconscious, and remained so for three days. The fever during the three weeks prior to admission to the hospital varied from 102° F. to 105° F. The examination of the blood was negative, both as to malaria and typhoid. This temperature continued for nearly a week after her entrance into the hospital (Fig. 13), and fell gradually. The urine contained many leucocytes for nearly a week and a pure culture of colon bacilli. The child was given urotropin and sodium citrate, and also an autogenous vaccine. On the twelfth day after admission the temperature dropped to normal and the urine now contained but few pus corpuscles.

Remarks.—The writer knows of few better examples of the multiform appearance of renal infection than the two cases just cited, and those occurring during pregnancy and the puerperium.

In regard to the etiology of the renal infections of children, there has been considerable speculation. Autopsies held upon these children show that there is unquestionably an involvement not only of the renal pelvis, but of the parenchyma as well, many of the cases showing miliary abscesses scattered throughout the cortex. For a long time these cases were called cystopyelitis, but it is more proper to speak of them as pyelonephritis, since the pelvis of the kidney and the parenchyma are about equally involved. The theory proposed by Franke is that many of these cases are due to infection from colon bacilli migrating through the wall of the intestines into the lymphatics which connect the ascending colon with the right kidney. There is also a number of lymphatics connecting the left side of the large bowel with the left kidney. But these latter are not as constantly present as those on the right side. What the significance is of these lymphatics and their relation to renal infection in children has not been clearly established, but it is well to remember that under conditions of inflammation, such as enterocolitis, or in cases of chronic obstruction or constipation it is not improbable that many colon bacilli enter the mesenteric lymphatics, and find their way to the kidney, although this has not been proved. Unquestionably, many of the cases are due to ascending infection from a cystitis, probably of colon bacillus origin. The interesting point is that of diagnosis, and one should always think of renal infection in every child with high temperature, especially if accompanied by a chill, and if the temperature is of the remittent type, and does not yield rapidly to the ordinary treatment for enterocolitis, etc. A negative Widal should always make one suspicious of such a renal infection in children. The urine may, as in the case of the pyelitis of pregnancy, show many corpuscles, but there is a number of cases in which but few changes in the urine are found. The majority of cases yield rather favorably to large doses of alkalies and of urinary antiseptics, and the alkaline waters. The conservative treatment is

usually sufficient, but if the condition does not yield to such measures operation should not be delayed. The great difficulty in operating upon these cases is to determine whether the other kidney is present, and able to functionate, and also to determine which kidney is involved. It is almost impossible to introduce a cystoscope in a child under the age of four, and ureteral catheterization is correspondingly difficult, so that one can easily see that the diagnosis is a very difficult one, and one must often content oneself with the diagnosis of renal infection, without being able to localize the disease in any side.

Group 5.—The next group of cases includes those cases of tuberculosis complicated by infection with the pyogenic micro-organisms, in which the symptoms produced by the latter predominate. These are extremely important cases from a diagnostic standpoint. The recurrence of chills and fever, as in the two following cases, and the symptoms in general of renal infection almost obscured the

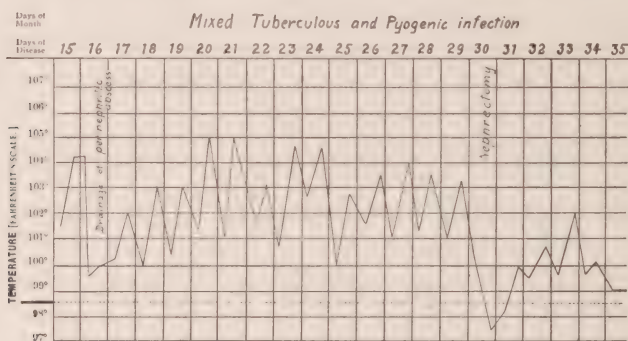


Fig. 14.—Case XV (952).

diagnosis of tuberculosis. In Case XVI (No. 227) the diagnosis of tuberculosis was made by an examination of the urine and the finding of tubercle bacilli before operation. In the second case no suspicion of tuberculosis was entertained until the kidney was inspected after its removal. The case reports are so complete that the writer will refrain from further explanation. Suffice it to say that this is a group of cases which have not been studied as much as they deserve. Many of the cases of renal infection are probably a secondary process engrafted upon an underlying tuberculosis, as in both these cases, and a study of the two clinical histories here given may be of some interest.

CASE XV, No. 952.—Mixed tuberculous and pyogenic infection. Male, *æt.* twenty-nine. Entered the hospital on August 27th, 1912, complaining of pain in the left lumbar region and left lower abdomen, and general weakness. For the preceding few weeks he had felt himself getting weaker and weaker, with sweating during the day and at night. He had attacks of fevers, chills and severe pain in the left lumbar region, which radiated forward into the ab-

domen, but never into the thighs. Had noticed pus in the urine, but never blood. The previous history was negative. Had had the ordinary diseases of childhood. His general appearance was that of a well-developed and well-nourished young man, somewhat anemic. A large indefinite mass could be felt in the left ilio-costal region, but this was obscured by the marked rigidity of the entire left half of the abdomen. This rigidity began at the midline, and extended uniformly toward the back. There was exquisite tenderness over this entire left half of the abdomen, especially over the left ilio-costal space. At a second examination one could not feel this distinct mass on account of the rigidity. First thought was that the condition was that of an intraperitoneal inflammation, either of a left-sided appendix, or of a diverticulitis of the sigmoid. For this reason an exploratory incision was made along the outer edge of the left rectus muscle, and the intestines and sigmoid in that vicinity examined with negative results. One could, however, feel a mass around the lower pole of the left kidney, so that the original abdominal incision was closed, the patient turned upon his side, and the usual left kidney incision made. As soon as the perirenal fat was exposed, about eight ounces of thick yellow pus escaped. So far as palpation was able to elicit, there was no involvement of the parenchyma, so that the diagnosis was made of a perinephritic abscess, a tube inserted, and the patient sent back to bed. His temperature upon entrance rose very rapidly to 104.4° F., and dropped as rapidly after the drainage of the perinephritic abscess, on the day following his admission, to normal. It began to rise, however, on the following day, and continued in a septic type, dropping in the morning to 100° F. or slightly above, and rising in the evening as high as 105° F. This remittent septic type of temperature continued for thirteen days, and then, on account of its persistence, and the persistence of pus in the urine, with negative x-ray examination, it was decided to explore the wound again to determine the cause of the persistent temperature. This revealed that the kidney was imbedded in very vascular adhesions, and that the lower pole had been in contact with the abscess which had been drained two weeks before. The upper pole was greatly enlarged, about the size of two adult fists, studded with large abscesses, many of which ruptured with the loosening of the kidney from its bed. The distal cut surface of the ureter showed that the walls of the ureter were considerably thickened, the lumen dilated, and from the latter thick yellow pus escaped. Now anomalies of the renal arteries or veins were visible. The kidney on section showed great enlargement of its upper pole, and on the cortex were several abscesses which had ruptured. On section, the pelvis of the kidney showed very few changes, the mucosa being quite pale. The same was true of the ureter. The lower pole of the kidney presented practically a normal appearance, but the upper half of the kidney showed marked pathological changes, there being very little kidney normal in character left. The entire upper pole was occupied by a succession of abscess cavities, each of which possessed a distinct lining membrane and contained thick greenish-yellow pus. His leucocyte count on admission was 22,400. The urine showed a trace of albumin, a large number of pus cells, and a few hyaline casts. Throughout his stay in the hospital the urine constantly showed a large number of pus cells, no sugar, and only traces of albumin. The only etiological factor was a former osteomyelitis of one of the fingers, from which he had suffered about a year before. No cultures were made from the urine, and it was only on examination of the removed kidney that a diagnosis of tuberculosis was made from microscopic section. One saw, in the places where the kidney substance had been replaced by granulation tissue, many miliary abscesses and foci of caseation. Microscopically, the pathologist also reports that there was a circumscribed area in the upper pole of the kidney, about 4 by 5 cm. in breadth, extending from the cortex to the pyramids. This was composed of

grayish-white tissue, in which were seen numerous small abscesses, from $\frac{1}{2}$ to $1\frac{1}{2}$ cm. in diameter, each surrounded by a distinct wall. Interspersed between these were yellowish areas, irregular in outline, composed of caseous material.

CASE XVI, No. 227.—Mixed tuberculous and pyogenic infection. Male, *æt.* forty-five, was first seen in consultation with Dr. Simon on August 24th, 1908. During the summer of 1907, he had had an attack of fever, following several chills, and since that time he has noticed a gradual loss in weight and strength. He was only able to pursue his occupation with a great deal of difficulty. About one week before seeing the case the writer received the history of his having had a recurrence of the chills and temperature from which he had suffered one year before. The case was thought to be a possible infection of the kidney, but a careful search for organisms showed, in addition to the colon bacilli, the presence of tubercle bacilli in the urine on one occasion. When first seen by the writer the patient looked pale; there was some tenderness over the right kidney, but no enlargement of the same. The urine contained a large amount of pus, and a repeated search was made for tubercle bacilli in the urine during his stay in the hospital prior to operation (three weeks) without success. After entering the hospital his temperature ranged between 98.4° F. in the morning and 100° F. in the evening for six days. Then on September

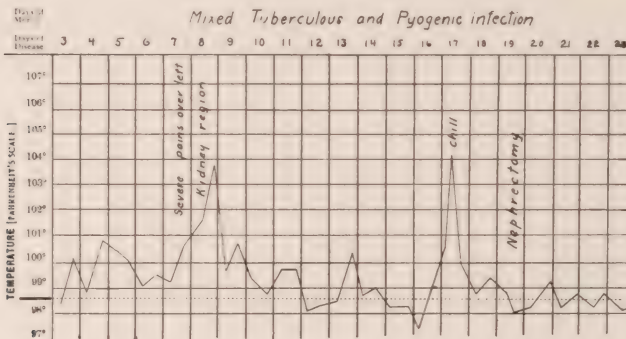


Fig. 15.—Case XVI (227).

1st he complained of severe pain in the bladder and left kidney region, with increased frequency of urination, especially at night. The morning temperature on September 1st was 101.4° F., and at three o'clock was 103.6° F., without any intervening chill. Only the above pain in the left kidney on the side opposite to that on which the disease was found at operation led us to believe that whatever condition was present was on the left side. The cystoscopic examination did not reveal any condition pointing to a tuberculous lesion of the left kidney. During the following eleven days the temperature remained practically normal. On September 13th, the morning temperature was 101.8° F.; the patient then had a chill, and at 10:50 a. m. the rectal temperature was found to be 104.2° F. The white blood count was 11,500, and the chill and fever were followed by a profuse sweat. The temperature again fell during the next two days to normal, and on September 16th a nephrectomy was performed by the writer.

The kidney was not enlarged; it presented a reddish-brown appearance; on first inspection of the exterior of the kidney one could not find any evidences of pathological changes, but on further examination a yellowish area was discovered close to the hilus which, on being incised, evacuated considerable caseous yellow pus, resembling typical tuberculous pus. The pathological report

showed that the kidney was of normal size, and showed all the typical changes of an incipient tuberculosis. On section there were two spherical masses about 1 cm. in diameter at the lower pole, which protruded slightly above the surface of the surrounding parenchyma. On section these masses looked pale, grayish-yellow, and small nodules could be distinguished. On pressure, a caseous material escaped. The upper pole of the kidney showed a similar tuberculous focus. Microscopic examination of the caseous material from the lower pole failed to show any tubercle bacilli. These, however, were found in the caseous material from the upper pole focus. Microscopic examination showed an infiltration with mono- and polynuclear cells, and also round foci composed of lymphoid and epithelioid cells. The patient made an uneventful recovery, has gained about 50 lb. in weight, and is able to pursue his occupation without any difficulty.

Group 6.—This includes cases of chronic pyelitis or pyelonephritis in which the constant presence of bacteria within the upper urinary tract predisposes to the precipitation of salt and the formation of urinary calculi. This recurrence of calculi is one that has received but little consideration, and will require considerable study in the future. The recurrence after operation has been fully dealt with in a previous article by the writer on bilateral urinary calculi, published in *Surgery, Gynecology and Obstetrics*, August, 1913. One of the cases reported here forms a portion of this other article. The history is that of a young man of twenty, first seen in 1908, complaining of a dull, aching pain alternating first over one kidney and then over the other. These symptoms had lasted four years, but there had never been any distinct renal colic, or the passage of calculi, or visible blood in the urine until about three years after the onset of the first symptoms, when he had pain over the left kidney, quite severe, radiating along the left ureter, and accompanied by chills and fever and the passage of what he called gravel and blood. The radiographs taken at this time showed many calculi in both kidneys, and the writer removed, in 1910, fourteen from the right kidney and seven from the left. The destruction of both kidneys in the form of an infective hydronephrosis seemed so advanced on inspection of the kidney that removal of either one was deemed out of the question, since the other could not carry on the work of both. One and a half years after the removal of calculi from both kidneys he was seen by another surgeon, and a radiograph taken by him showed just as many stone shadows as had been present prior to the writer's first operation. This surgeon removed phosphatic material and formed calculi from both kidneys in as large number as the writer. A third series of radiographs, taken one and a half years after my colleague's operation, showed as many shadows again over both kidneys, signifying without doubt reformation of calculi. The urine has been constantly full of pus corpuscles and colon bacilli.

CONCLUSIONS.

1. Infection of the kidney may take place by one or more of four routes, a combination of several routes not being an exception. The first is the blood route (hematogenous); second, the so-called urogenous, along the interior of the ureter, the micro-organisms being carried up into the pelvis of the kidney with the stagnant urine; third, the lymphogenous route, that is, from the lymphatics of the bladder to their communication with the lymphatics of the ureter up along the latter to the pelvis and into the lymphatics of the kidney. From the writer's observation this is not at all a rare form of infection. The fourth, the connection of the lymphatics of the colon with those of the kidney. This route has not been proved, but seems a plausible explanation for some of the cases, especially those occurring in infancy and childhood.

2. Many of the cases of renal infection are dependent upon the presence of a calculus blocking the ureter, oftentimes the pelvic portion, or at the ureteropelvic junction. For this reason a routine examination with the x -ray of every case of renal infection should be made, if possible.

3. Many of the cases of renal infection are masked by the pseudo-malarial chills and fever, or the typhoid-like course of the temperature. In every case of temperature in which a negative Widal or malarial test has been made one should always think of the kidney as the possible source of the infection.

4. The symptoms of renal infection are oftentimes so indistinct that the kidney is not thought of as the source of obscure fever. Tenderness and other local signs are not infrequently absent, even though the general symptoms are of the most septic character.

5. Both acute and chronic hematogenous and urogenous forms of infection may be unilateral, and their early diagnosis may greatly assist in removal or other methods of treatment of the infection.

6. The best method of eliciting tenderness over the kidney is either by bimanual palpation or by palpation at the costovertebral angle. The most reliable evidences clinically of renal infection are, however, those obtained by the use of the cystoscope and the ureteral catheter.

7. Pelvic lavage is of more assistance in the cases of chronic than those of acute infection of the renal pelvis. At times in the pyelitis of pregnancy and of the puerperium, if they do not yield to conservative treatment, the pelvic lavage will often cut the disease short.

8. Reformation of renal calculi in kidneys which are the seat of chronic colon bacillus infection is not infrequent, and must be considered in giving the prognosis of any case in which a stone has been removed, where the kidney is the seat of a long-standing

infection. The calculi will reform as long as infection is present. Not infrequently such infection is bilateral, necessitating the avoidance of a nephrectomy on account of the advanced condition of the disease in both kidneys.

9. In children with high temperatures, especially of the remittent type, the kidney should be thought of immediately as the possible source of infection.

10. In the most severe types, both of urogenous and hematogenous infection, the general septic symptoms in the form of bacteriemia may mask the local condition completely. The longer the obstruction of the urinary passages exists, with infection of the kidney, the more advanced are the pathological changes in the latter.

11. Primary nephrectomy, if the opposite kidney is capable of doing the work of both, is to be preferred in advanced cases of renal infection to a conservative method. A secondary nephrectomy is exceedingly difficult, on account of the very firm adhesions and the danger of hemorrhage. The term pyelitis is often mistaken in its application. The majority of cases belong to the type of pyelonephritis, both the parenchyma and the pelvis of the kidney being involved.

12. Cases of mixed infection of tuberculosis and pyogenic microorganisms are very difficult to diagnose, and must be thought of in the majority of cases of renal infection of the chronic type. The bladder symptoms, which are often so marked in the ordinary type of tuberculosis, are entirely absent or are not present in sufficient degree to lead one to suspect the presence of tuberculosis.

13. Conservatism should be the rule in all cases of renal infection except those of the hyperacute type. In the latter, nephrectomy should be performed as early as possible. In the acute form of renal infection, whether hematogenous or urogenous, one should at first try the conservative measures outlined above. Even a nephrotomy with decapsulation of the kidney and the puncturing of the little abscesses scattered over the cortex may save the kidney. One should not, however, wait too long with such conservative measures, and if a prompt response is not obtained, nephrectomy should be performed at once.

THE CLASSIFICATION AND TREATMENT OF CONVULSIONS IN INFANCY.

By CLIFFORD G. GRULEE, M. D., of Chicago.

Introduction.—There are few chapters in medicine that present to us such a varied and unknown field, and at the same time such necessity for immediate action as does the chapter concerning convulsions in the first months of life. Unlike that occurring in the adult, a convulsion in the infant is generally of such a nature that even though the convulsive seizures be local, one can seldom draw conclusions from this as to the location of the lesion in the brain. In fact, perhaps most of the localized convulsions are indicative of general processes, and are not suggestive of any gross or permanent lesion of the portion of the brain to which these convulsions would seem to refer. Having this in mind, it seems to the writer that a classification is especially needful, and one which will take up the etiological factors involved. Any attempt to classify such varied conditions as one finds in medicine usually meets with more or less failure, and one can, therefore, justify classification only inasmuch as classification tends to clarify and not cloud the subject in question. The classification which the writer has used for some time, and which seems to him to cover the field fairly well, is as follows:—

1. Terminal convulsions.
2. Symptomatic convulsions.
3. Uremic convulsions.
4. Convulsions due to intracranial pathology.
5. Epileptic convulsions.
6. Spasmophilic convulsions.

One may well question whether Nos. 4 and 5 should not come under one head, but epileptic convulsions are so distinct in character as to justify a separate position in the classification.

Terminal Convulsions.—These convulsions are most often seen in very young infants, dying in a severe state of marasmus, or sometimes at the end of some acute febrile disease. The convulsive seizures are usually not severe. They may affect the extremities or the facial and eye muscles, and are usually generalized in character. As to what the exact nature of the condition underlying these convulsions is, we do not know. Occurring when they do and as they do, from the standpoint of treatment they offer little, and no more need be said of them in this place.

Symptomatic Convulsions.—This type of convulsion is quite frequent. It occurs usually in the acute stage of onset of some acute febrile affection, such as the acute exanthemata, or pneumonia, and so forth. Sometimes these convulsions are single, sometimes multiple, and certain children seem to be especially prone to this condition. At any rate, convulsions occur repeatedly on the slightest provocation, following or initiating the onset of some acute febrile trouble. Very frequently the physician is not able to reach the patient before the convulsion has ceased. It is commonly thought that immersing these children in hot water or applying cold applications to the head, and so forth, are of much value. It seems to me very doubtful whether this is the case. The condition is such a severe one that we feel called upon to do something, and that in a hurry. The convulsion, however, usually goes through to its termination without interruption, no matter what is done. To prevent the recurrence of such convulsions, the use of sedatives is advisable. For this purpose, chloral hydrate given well diluted, a grain to the ounce, rectally, is of much value, and can be used without much danger. Young infants will take as high as two or three grains at a single dose without causing any alarming symptoms. Sometimes it is wise, in order to prevent recurrence of this condition, especially if the febrile period is long drawn out, to keep these children well under the effects of a sedative. In the writer's hands the bromides have been rather ineffective. During the acute stage, to prevent the recurrence at a short interval, where there seems to be imminent danger of such, the use of anesthetics, even in the form of chloroform or a sedative as powerful as morphine, may be advisable.

Uremic Convulsions.—Uremic convulsions are very unusual in young infants. They occur only in very rare instances, aside from the cases where the uremia is due to a scarlatinal nephritis. Acute affections of the kidney are so rare in infancy, aside from that type of infection with *B. coli*, that this form of convulsion is rarely a subject for treatment. Hot packs and alcohol sweats are of a great value. The use of an alkaline solution, as advised by Fischer, has met with much success in the few cases in which the writer has tried it. Spinal puncture, too, seems in certain infants to bring relief, and certainly is to be advised in severe cases, with rapidly repeating convulsions. As a rule, the convulsions in uremia repeat at short intervals, and last but twenty-four to forty-eight hours, after which the child frequently makes an uninterrupted recovery. Hence in these cases all our efforts should be towards controlling the convulsion in a short time, and, if possible, not putting any extra work upon the kidneys. Free catharsis is very advisable in these cases.

Convulsions Due to Intracranial Pathology.—There are, perhaps,

few intracranial lesions in infancy which do not at one time or another produce convulsions. Even an atrophic condition of the cerebrum may have its occasional convulsion. Of course, the chief intracranial cause of convulsions in infancy is meningitis. All forms are accompanied by convulsions, but the acute types, such as meningococcic meningitis and septic meningitides are especially prone to have violent convulsions. In tubercular meningitis the convulsions are more apt to be less violent and frequently localized. One should not lose sight here of convulsions which frequently occur in meningismus or serous meningitis complicating some acute infection. Most cases of hydrocephalus will show at one time or another some convulsions, but the syphilitic hydrocephalus which is so gradual in development and comparatively mild in degree is not frequently the cause of convulsions.

Among other things may be mentioned brain tumors and intracranial hemorrhage of the newborn.

An interesting case in connection with the latter affection was one to which the writer was called in consultation recently. It was a baby, four days old, with a melena neonatorum which stopped within a few hours after the use of horse serum subcutaneously and gelatine by mouth. It was thought advisable to give the child strychnia to the amount of 1/1000 of a grain, every four hours, hypodermically, and this was ordered. The next day the writer was hurriedly called back to see the case because of convulsions. The child had had several convulsions and the interesting point in differential diagnosis lay as to whether the convulsions were the result of an intracranial hemorrhage caused by the evident tendency to hemorrhage, or by the strychnia. The writer confessedly inclined strongly to the former opinion, but on removal of the strychnia the child made an uneventful recovery, and no more convulsions occurred.

Perhaps one might speak here of convulsions occurring from drugs, but they can hardly be regarded in a special class of convulsions, since their occurrence is happily very rare.

The treatment of convulsions from an intracranial standpoint is evidently the treatment of the underlying condition, and the discussion of such would certainly be out of place in a paper of this nature.

Epileptic Convulsions.—We come now to epileptic convulsions. Contrary to the opinion of most, it is believed by those who have thoroughly investigated the matter that epilepsy originates more frequently in the first year than in any of the succeeding years. According to Birk, of 70 cases originating before puberty, 10 originated in the first year of life, and of the remainder, 44 began in the first eight years of life. One so often regards convulsions in infancy as of a nature peculiarly mild, that the thought of epilepsy

occurring at this age is rather remote. The epileptic convulsion in young infants is usually generalized in character. It occurs singly, at times two may occur within a short period of time. The intervals between the convulsions are long at first and show a distinct tendency to decrease, though this may vary quite a little with the individual case. They occur as frequently in breast as in artificially fed infants, and show no increase in electrical irritability. They frequently occur in children who later show a distinctly lowered mentality, and it is very difficult to determine whether the epilepsy is the causal factor or some intracranial condition determines the presence of epilepsy.

It has long been said by many writers, and especially English writers, that the ordinary convulsive seizures which we so frequently see in infants are very often followed by epilepsy in later life. It has been the service of Birk to disprove this theory to a large extent. Of 53 children whom he was able to follow from infancy on, and who showed a distinctly increased electrical irritability, in no instance was there an epilepsy of any degree whatever. While it is possible that during the ordinary convulsive seizures of a spasmophilia, intracranial hemorrhages, or something of that nature, may occur, such must certainly be an extreme rarity, and there is no reason to believe that such distinctly different conditions as epilepsy and spasmophilia have the same etiology, or that spasmophilia prepares the way for a succeeding epilepsy. It is altogether likely that epilepsy begins as a distinct clinical entity, and, as such, continues to its termination.

Spasmophilic Convulsions.—We now come to a class of convulsions which perhaps represents a majority of all convulsions occurring in infancy, that is, the spasmophilic type. These convulsions have several distinctive characteristics. First, their tendency to rapid repetition. The writer has seen as many as seventy in twenty-four hours. Second, the frequent occurrence of laryngospasm in these cases. Third, the increased electrical irritability. Fourth, the fact that almost all these cases occur in artificially fed infants who are suffering from some nutritional disorder.

Just a word as to the electrical irritability. These reactions are done with the use of the galvanic current. For the cathodal reactions the anode is placed on the abdomen and the cathode over the median nerve on the inner side of the elbow. The current is then made and broken. The cathode closing contraction is usually of little significance, but in normal conditions the cathode opening contraction of the index finger can be produced only with a current of 5 milliamperes or more. Should the contraction be produced with a current of less than 5 milliamperes, the electrical irritability is said to be increased.

For the anodal contractions the cathode is placed on the abdomen

and the anode in the same position as the cathode in the previous reaction. In other words, the direction of the current is reversed. When the anodal opening contraction is produced by fewer milliampères of current than is the anodal closing, the electrical irritability is said to be increased.

Of these two reactions, the cathodal reaction is the more suggestive.

In no other type of convulsion in infancy is there an increased electrical irritability. One should here make the reservation that it is conceivable that a spasmophilic state may be present at the same time as convulsive seizures from some other cause. But taken by and large the increased electrical irritability is a very strong diagnostic point in regard to the spasmophilic convulsions.

As to the differentiation of these convulsions from the other types above mentioned, the greatest difficulty perhaps lies in the case of the epileptic convulsions, and the differential points in regard to this have already been given. Of all the convulsions mentioned, this type is perhaps most amenable to treatment.

As prophylactic measures perhaps, first, nourishment with breast milk should be mentioned. In a child who has had one attack of convulsions it is very advisable, where possible, to put the child on breast milk. Then, if possible, the electrical reaction should be watched and the child promptly treated when any increased electrical irritability comes. Fresh air and good hygienic surroundings should be emphasized.

As to the treatment of the active condition, we may take this up under several headings. First, hygienic. The writer does not know why, but it has seemed to him in several cases that good fresh air was especially desirable. Cold air is not advisable, because of the shock which it produces, and hence may be the cause of the onset of a convulsive seizure. Cleanliness, especially the frequent changing of the diapers, is to be carefully watched. Undue handling should be avoided, and all noise should be stopped, where possible. More attendants than are absolutely necessary to take charge of the child should be kept from the room.

In a dietetic way much can be done. During the acute stage it is wise to take away all food and put the child upon barley water. This should not be continued too long. It is a well-established fact that these children will take starchy foods much better than milk. In other words, the starchy foods do not seem to increase the electrical irritability; hence a rather strong starch mixture may be given after the convulsive seizures are fairly well under control without much danger of increasing the tendency. Finkelstein some years ago suggested removing the whey from the food. With this line of treatment the writer has had quite a little experience, and it has always seemed to him that the whey was the element of

food which produced the tendency to convulsive seizures. In many cases he has been able simply by removing the whey to decrease the electrical irritability, and by adding it again to produce a renewed increase. By experiments with the various salts contained in the whey, such as potassium, calcium, sodium, and so forth, he has, however, never been able to produce the same reactions as were to be seen with the use of the whey itself. He would, therefore, strongly advise that after the first twenty-four hours curds suspended in a rather thick starch water, preferably arrowroot starch, should be used, and that the whey be only gradually added, perhaps best in the form of buttermilk. In this connection one might state, too, that cod-liver oil has been shown to produce a gradual but steady decrease in the electrical irritability, and may be strongly advised after the acute stage of the trouble. During the convulsive seizure it is very necessary that sedatives be given. Chloroform is frequently used, and morphine hypodermically. For immediate effect nothing can take the place of these two drugs. However, because of the long-recognized idiosyncrasy of infants to morphine and opiates, in general, it seems wise to use some other sedative where possible. In most instances the bromides are not sufficiently sedative in their action to produce the desired results. Chloral hydrate seems to be very efficient in this respect. It must be given rectally, and should be given well diluted, in the amount of two or three grains for the initial dose, and a grain every four hours subsequently, the interval between doses being gradually increased. Sometimes it is necessary to give small doses of chloral hydrate over a period of two weeks.

Very frequently this condition follows a severe constipation. In this instance it is necessary to clear out the intestines first by the use of a flushing, and then by the use of rather drastic catharsis.

With the line of treatment here given one can in most instances overcome an attack of spasmophilic convulsions. One should always remember, however, that certain of these babies die in the first few convulsions, and that it is impossible to save them. These convulsions are those of the so-called apneic type, where the diaphragm is evidently in a prolonged state of spasm. In this type immediate treatment is imperative. Perhaps the best results may be obtained by dipping the child from a tub of hot to a tub of cold water repeatedly. The writer has seen this carried on for as long as an hour, with excellent results. The child, apparently dead at the start, finally revived and for many months thereafter was perfectly well.

Berend claims excellent results from the use, subcutaneously, of 15-30 c.cm. of an 8 per cent. solution of magnesium sulphate in all forms of spasmophilia.

CONCLUSIONS.

In conclusion, the writer wants to lay emphasis upon the necessity of differentiating the various types of convulsion, in order to arrive at definite results with treatment. It is especially necessary to differentiate the epileptic from the spasmophilic type. This, in many instances, is comparatively easy.

The use of electrical irritability which, as I know, has not as yet been taken up by the general profession, is to be advised, because it means so much in the future treatment of these conditions.

It is probably impossible to bring a child many miles to an office in order to be able to test the electrical irritability, but after the convulsive seizures have ceased, the determination of their cause will be of distinct advantage to the patient.

122 S. Michigan Ave.

THE NON-VIRULENT T. B. VACCINE IN THE TREATMENT OF TUBERCULOSIS.

By BENJ. R. HOYT, M. D., of Detroit, Mich.

When a case of pulmonary tuberculosis has advanced to a stage where tubercle bacilli may readily be found in the sputum, usually enough damage has been done so that under most favorable hygienic conditions a tardy recovery takes place even where favorable results are being obtained. At least, that has been the writer's experience in an active general practice extending over a period of forty years. Long experience in the practice of medicine tempers judgment and makes us reluctant in ascribing virtues to new remedies; but the very favorable results obtained with the combined use of mixed bacterial vaccines and the non-virulent tubercle bacillus vaccine, prepared by Dr. G. H. Sherman, have prompted the writer to report a few cases that have come under his care during the past six months.

The 500,000,000 suspension of the non-virulent T. B. vaccine was employed, which was given alternately at four-day intervals with a mixed vaccine containing pneumococci, streptococci, staphylococci and colon bacilli, making inoculations of each vaccine eight days apart. By giving the vaccines alternately, in this way, the reactions obtained from the T. B. vaccine and the mixed vaccine will not conflict. These cases were all treated at the office and were only seen on the days when inoculations were made. For this reason, it is impossible to say if any febrile reactions were obtained which could be ascribed to the vaccine; but, by inquiring from the patients, as to how they felt after the inoculations, it appears that no marked febrile reactions were produced. Treatment was started with about 50,000,000 of the non-virulent T. B. vaccine, and after that the dose was gradually increased to 750,000,000 organisms. After the first few inoculations, there was some complaint of soreness where the injection was made, but after that not much disturbance followed even larger doses.

Focal reactions, with an aggravated condition of the clinical symptoms such as is often seen after giving old tuberculin, have not been observed. For this reason, the writer considers the non-virulent T. B. vaccine a perfectly safe remedy to use.

CASE I.—Painter by occupation, presented well-defined clinical symptoms of pulmonary tuberculosis. Sputum examination at the Detroit Board of Health developed T. B. positive. This patient was treated at intervals of four days,

alternately, with the non-virulent T. B. vaccine and the mixed vaccines for one month. After this he received weekly treatments of the T. B. vaccine until January 15th, 1914. He resumed his work as painter December 15th, having increased in weight 15 lb.; was free from cough, expectoration and fever. The writer now considers him clinically well. Began treatment August 23rd, 1913.

CASE II.—Female, has been fighting pulmonary tuberculosis for three years. Sputum examination by State Board of Health, T. B. positive. This case received treatment about the same as the foregoing case. She shows marked improvement, increase in weight, cough and expectoration much less, temperature normal.

CASE III.—Began treatment August 27th. Family history: Father, two brothers and two sisters died of tuberculosis within the last six years, and the mother has had two severe hemorrhages during the last year. This case had a secondary anemia that resisted iron and arsenic. Under the writer's treatment presented evening rise of temperature. Slight cough, dullness at apex of right lung, prolonged expiratory murmur with abundance of fine râles. This case was treated alternately with non-virulent T. B. and mixed vaccine at intervals of four days. She resumed her trade as milliner October, 1913, and at this writing the patient appears to be in perfect health, notwithstanding she is living in the same house that her relatives have died in.

CASE IV.—Well marked clinical symptoms of T. B. Sputum examined at the Board of Health was T. B. positive. This case was under treatment one month with marked improvement. Patient, for some reason, refused to continue treatment and the writer is informed that the disease is progressing.

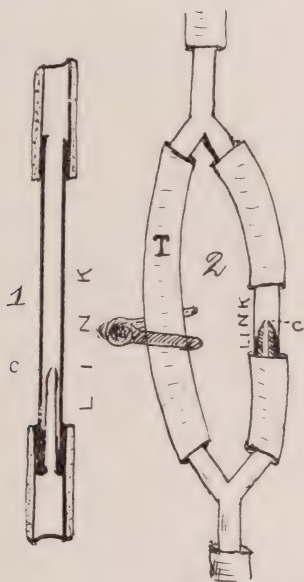
CASE V.—Employed in City Fire Department. Began treatment November 10th, 1913. Patient began to develop symptoms of pulmonary tuberculosis December, 1912, with a history of hemorrhages, fever, cough, expectoration, etc. Has been under various forms of treatment. This case has received the mixed vaccine treatment exclusively at intervals of four days. Had slight hemorrhage one month after he began treatment. Since that time has improved rapidly in weight, strength, etc., with no symptoms of former disease excepting slight cough. He continues at his work, and is very much pleased with the way he is progressing. Hygienic and food regulations were also recommended.

935 Vinewood Avenue.

A POSITIVE READING MANOMETER.

By EDWARD VON ADELUNG, M. S., M. D., of Oakland, Cal.

In a previous communication the writer called attention to the fact that workers in artificial pneumothorax are reading their manometers differently. There seems to be no uniformity in recording intrathoracic pressures. As is well known, the fluid in the manometer is in constant motion, necessarily so, because the intrathoracic pressure is constantly changing, due to the patient's breath-



Figs. 1 and 2.

ing. Some operators are recording maximum readings, others minimum readings; both of which figures vary more during any particular observation than the figure that represents the mean pressure. The writer, therefore, advocated a uniform system for recording pressures, recommending that mean pressures be the standard.

The writer now wishes to call attention to a simple attachment for the manometer, very inexpensive, very simple and attachable to any form of manometer. This device produces a non-oscillating registration of the mean pressure, changing the action of the manometer in a way the value of which is fully appreciated as soon as seen.

Description of Attachment.—The device is shown in Fig. 1. A capillary tube *c* is fixed in a heavier tube (for protection), so that the pressures must reach the manometer through the small opening *c* of the capillary tube. This link is placed in one limb of the divided tube that leads to the manometer as shown in Fig. 2. By pinching off the rubber limb, T, all pressures are forced through the link, L. When T is pinched off the manometer will register the mean pressure, either positive or negative, unobscured by oscillations. The writer believes that the adoption of this capillary link would render the records of all workers uniform in their meaning—something very much to be desired. One unfamiliar with this attachment might immediately object that the oscillations are the very thing so necessary for safe work, inasmuch as free oscillation is the best indication that the needle opening is in the pleural space. With the arrangement the writer has described, all that need be done to obtain information on this point is to leave T open when oscillations will occur as usual. Thus both uses of the manometer are readily available.

The advantages of the capillary link are:—

1. Ease of reading.
2. Uniformity of records.
3. Protection of manometer when patient coughs or strains.
4. Greater accuracy, inasmuch as the mean pressure varies less than either the maximum or minimum.
5. Simplicity.

OBSTETRICAL SUPERSTITIONS—PAST AND PRESENT.

By GEORGE GELLHORN, M. D., F. A. C. S., of St. Louis.

The craving to find explanations for the causes of things is deeply inborn in the human race. When savage man first raised his eyes to look around and above, he found himself confronted with innumerable riddles for which he must needs seek an answer; and the growth and development of civilization throughout the ages stands in a direct proportion to the zeal with which the search into the unknown manifested itself. At certain epochs, the current towards enlightenment has been impeded by external obstacles, but only to burst through with renewed force. Often would the mighty stream break through its own banks and lose itself in side-channels, but it would always recede into its bed again, leaving behind it stagnant pools which would not dry up for centuries. Might we not, in a broader sense of the word, speak of these pools as of superstitions?

The development of medicine reflects that of mankind. From the crude nature-worship born of fear and applied to human ills, to the cellular pathology of Virchow there is that same striving for a causal nexus, an unending sequence of errors and corrections; and it is the oldest branch of medicine, obstetrics, that most clearly portrays every phase in the mental evolution of the race.

The history of obstetrics is more than a mere recounting of the achievements of the generations that have preceded ours; it is the history of civilization; and, generally speaking, the study of obsolete beliefs and customs, of obstetrical superstitions, gives us an excellent insight into the intellectual workings of our forefathers.

This field is, however, so wide that it would require years of study to do it full justice; and within the scope of a short address only an attempt can be made to select at random a few of the curious customs of the past.

The determination, or, at least, the prediction of the sex of the fetus in utero was of great practical importance even in the earliest times, for every male child meant an addition to the fighting strength of the tribe. The nations of antiquity, the Jews, the Greeks, and the Romans, believed that boys were born from the right side of the mother while girls originated in the left side.¹ Their anatomical knowledge was derived solely from observations on sacrificial and other animals, notably cattle which have a bi-

cornuate uterus, and a like condition was at once assumed for the human female.

In consequence, the diagnosis of the sex was made from the greater fullness of one or the other breast, the difference in size of the two sides of the abdomen, the more vigorous action of the different extremities, from the quality of the pulse on the two sides, etc.; or whether a drop of blood or milk from the right side would swim or sink in water. Colostrum of the expectant mother dropped into her urine would coagulate if the fetus is a boy and dissolve if a girl. Soranus² saw in the sediment of urine in the vessel a prognostic sign. Paullini,³ a German author who flourished at the end of the seventeenth century, refers to the custom of sowing wheat and barley soaked in the urine of the prospective mother. A son may be expected if the wheat grow up first, and vice versa. A superstition which can be traced back to dim antiquity but has survived to this very day is the belief that a woman looks healthy and comely when carrying a boy, while a girl produces a sickly appearance, pale complexion and chloasma uterium. The peasants in the southwest of France have a very simple way of foretelling the sex. A pregnant woman tosses a silver coin over her shoulder. If it alights with the face upturned the child will be a boy.⁴ Jakob Ruff,⁵ of Zurich, a famous obstetrician of the sixteenth century, adopted all the diagnostic signs of Hippocrates and added that vaginal tampons saturated with a mixture of a certain powder in honey would cause a sweet taste if the fetus was a male and a bitter taste if a female. He also believed that younger women will, as a general rule, bear more boys because the uterus was more vigorous than in later years, and it may not be amiss to remark here that modern statistics have proved the opposite to be true, at least so far as old primiparæ are concerned. Ruff also sees in the protrusion of the umbilicus a sign of male sex, a view which is still extant in Italy where, according to Riccardi,⁶ a rounded and less prominent abdomen indicates the advent of a girl baby.

Happy the woman who carries a child beneath her heart! Her less fortunate sister who remains barren has seemed to most nations to be under a curse inflicted by demons or sorcerers. The maternal instinct thwarted in its fondest hopes has, throughout the ages, sought untiringly for means to cure sterility. Moreover, the sterile woman was an object of ignominy and contempt, and exposed to ill treatment on the part of the husband and his family; and the writer has always felt that the passionate longing for children that drives the sterile women of the Ghetto into our clinics and makes them willing to accept any kind of treatment proposed, is, in part at least, a survival of the old fear of disgrace.

The means against sterility frequently consisted of aphrodisiacs, many of which were of a most peculiar, if not repulsive nature.

Thus Paullini, in 1714, recommended excrements of geese. Others advised powdered ivory, and in the writer's native province, Silesia, the pulverized shavings of antlers are still considered a helpful remedy against barrenness.

In ancient Rome, the festival of Lupercalia was held in the month of February. The priests of this cult struck one another with whips made of leather thongs, and sterile women would offer their bodies, and particularly their palms for flagellation in the belief that the blood stirred up by the beating of the hands would run faster to the heart and thence to the uterus, rendering the latter more susceptible to conception.⁷

Hippocrates knew of local treatment against sterility in the form of vaginal suppositories, and Ruff, whose work has already been mentioned, devotes no fewer than 84 out of a total of 249 pages to a detailed therapy of sterility.

But in addition to medical and other means, the assistance of the deity was always implored, and exorcisms and amulets have had and still have their influence in widely different parts of the world. As an example, we may here refer to Cusacqu's studies. In the southwest of France there existed in antiquity a large number of springs, rocks, and old trees, to which the people attributed supernatural powers in curing certain diseases. This nature cult can be found in the traditions of all Indo-European races. The Church, in its earliest times, found it impossible to eradicate these ancient beliefs and legitimized many of them by placing them under the patronage of saints. Thus, at the entrance to the valley of Aspe in the Pyrenees there is a rock of conical shape consecrated to the Holy Virgin; it is the object of pilgrimages of sterile women who rub their abdomens against the stone praying to conceive. In all probability we have to deal here with reminiscences of an old Phallic cult, and it is more than likely that this rock in the dim past was a Phœnician place of worship.

The abnormal tastes and desires of pregnant women have always been of great interest to the impressionable minds of our ancestors. The famous Jakob Ruff, who has done so much for obstetrics, tells the following naïve story which the writer will translate in detail:—

"A pregnant woman passing a bakery and seeing the baker naked before the oven felt the irresistible desire to bite a piece out of his shoulder. But she did not know how to accomplish this, and she became despondent and went about for several days without partaking of any food. Her husband was greatly disturbed and tried in every way to induce her to eat. She finally confided that she would be well again if she could only eat what her heart was longing for, and confessed, after much persuasion, that she desired to bite into the baker's shoulder. The husband out of pity for his wife's con-

dition, promised the baker a certain sum of money if he would let her have her wish, and the baker was persuaded to permit the woman to bite him twice. But when she insisted on a third bite, the baker bolted because of pain. And when the woman was finally delivered she bore three children, two alive, and the third dead."

Fortunately, these abnormal desires were not always quite as blood-thirsty, but in every instance the wishes of pregnant women for certain food had to be gratified at once lest their children be born either puny or lick their tongues until given the same kind of food (Storch⁸); or else the child would bear upon its body the object of the mother's wish (Cusacqu).

This leads us to the subject of maternal impressions, a superstition which, in spite of all progress of civilization, is still rampant even among educated women and causes so much unnecessary anxiety to prospective mothers. It is highly deplorable that such obvious nonsense should be upheld by supposedly reputable physicians, as, for instance, by Rowan,⁹ who a year and a half ago reported among others the case "of a lady who was pregnant, and who, on her way home one day to a southern suburb where she lived, saw a heavy wagon pass over a dog, and literally cut half its head off below the eyes. The sight haunted her to such an extent that she sought advice about it. I attended her until at full term, delivered a well-developed male child, with a face more like a dog than a human being, and with the head missing above the eyes." Hence, Rowan has "not the remotest doubt as to the possibility of such influences."

It is a relief to learn that moles and birthmarks may readily be removed by midwives in Ireland by rubbing the affected part with pieces of placenta.*

Compared with the lot of her sisters in the Middle Ages, the pregnant woman of the twentieth century enjoys a life of ease, provided she can free herself from the beliefs and traditions of bygone generations. But to this day there are women who believe, as did the patients of Johann Storch in 1658, that lifting heavy cooking pots and placing them on their abdomens would cause the placenta to become adherent, or that reaching upward would wind the umbilical cord around the baby's neck.

In southern France a pregnant woman must not be a godmother lest her own child be a deaf mute, and in medieval Germany in a like case the own child or the baptised baby was surely to die. The dangers to pregnant women from people with the 'Evil Eye'¹⁰ and the causation of false pregnancy by witchcraft¹¹ may only be mentioned.

So hedged in by superstitions were the pregnant women of old and so numerous the rules of a correct behavior in pregnancy that

*George Dock (Personal Communication).

one could not possibly observe all precautions, and dire consequences, in the form of sickness or of difficult labor, were the inevitable result. There was, of course, a possibility of supernatural intervention. Thus there was a spring near Bayonne, France, which, according to pious belief, owed its origin to St. Leo. The water of the spring had miraculous healing power, particularly in diseases of pregnant women, and a certain Pédebaight, so Cusacqu tells us, made a lucrative business by importing this water to America as late as the middle of the eighteenth century.

In the same part of the world, labor can be accelerated if, at the onset of labor pains, the woman quickly slips on the breeches of her husband.

More difficult is the case if one or both arms of the child have prolapsed, in other words, a transverse position. De la Motte¹² tells of midwives who in such cases have tied the legs of a patient to a ladder and then raised the ladder in such a way that the head was down and the legs up. Then the ladder with the woman fastened to it was lifted and several times struck hard against the ground in order to change the faulty position of the fetus, but, as our author adds naïvely, "the child remained unchanged in its place and thus the exertion was for naught."

In the case of inertia with a dead child, a certain Spanish physician put a plate over the umbilicus and hit it with his fist with all his might, the patient testifying with loud screams to the intense pain. "But alas! the child was expelled presently, followed by a sharp hemorrhage."

Paullini, from whom this drastic treatment is quoted, would prefer in such a case a smudge of dried excrements of tame pigeons, or better still, of wild doves, "but how can you get that in a hurry, and if the patient has no money?"

After delivery, a new and extensive set of superstitious rules applies. Johann Storch decries as irreligious and nonsensical the custom of placing a knife or sword with which somebody has been murdered in the bed to prevent complications. He also warns midwives to give their patients three drops of blood from the umbilical cord against after pains, or to spit upon the baby before and after the bath, and he ridicules the custom of young mothers to have prayers said for them in three churches, but not in one, two or four churches.

On the other hand, he believes that if the uterus should contract before the placenta be expelled, a smudge of donkey's and horse's hoofs, passed through a funnel into the vagina, would remedy matters.

The newborn baby required particular attention. "As soon as the newborn has been washed, cleaned and wrapped up," so relates Ruff, "and before he is given food and drink, he should be placed

for one hour in the mother's bed, on her left side where her heart is. For she, quite naturally, will take all disease from the child and excrete it through her own lochial flow. This will be of the greatest benefit to the baby through his entire life and protect it against diseases of childhood, epilepsy and lepra. This may be repeated daily and at the same time the child should be given, both internally and as an ointment, a mixture of pulverized corals and sugar or sweet butter."

Of course, the best nourishment for the baby, even in those days, was the mother's milk, and many superstitions existed to preserve the precious food. Even nowadays, the peasant women of Bostens, in southern France, will make pilgrimages to a nearby cave containing stalactites which resemble mammæ. After offering a prayer, the women suck these stone formations.

It is interesting to note in this connection that as late as 1770, Tissot,¹³ a famous French obstetrician, believed that milk was formed in the vessels of the mother and was indeed identical with chylous fluid.

The writer cannot conclude this sketch without at least mentioning one of the most curious customs which has ever been in existence—namely, the male lying-in state, for which the French term *couvade* has been generally accepted. Immediately after delivery, the woman attends her regular household duties while the husband takes her place in bed for a number of days or even weeks, and receives the congratulations of friends and neighbors. According to Ploss the custom is still in vogue among the Indians of Central and South America and has been observed in widely distant parts of the world. Cusacqu claims that the custom still exists among the Basques and Bearnais in southwestern France who have inherited it from their ancestors, the Iberians. As a matter of fact, Strabo and Diodorus, of Sicily, reported it as existing among the Celt-Iberians and the Corsicans. Marco Pole found it among certain mountain tribes in China 600 years ago, and Herodotus mentions its occurrence in Africa.

The fascinating influence of this subject may have led the writer to impose unduly long upon your indulgence, and yet only a part of the collected material has been used. If we turn the leaves of the history of obstetrics, it is not all superstition and bigotry, naïve conceptions and ridiculous prejudices that we find there. Many a pearl of wisdom lies hidden in those musty volumes; many a great truth, which we fondly believe to be of our own times, has been in the possession of generations long passed into oblivion. And all this should make us think, with charitable kindness, of the foibles of the past, for who can tell but that in a hundred years from now some of *our* most cherished views may not be looked upon as superstitions?

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TENDON REFLEXES AND BONE REFLEXES.

By DR. J. BABINSKI, of Paris,

Lectures delivered at the Hospital de la Pitié, reported by Drs. Albert Charpentier and J. Jarkowski, and reviewed by the author.

(Translated, with some additions in brackets, by
CHARLES GILBERT CHADDOCK, M. D., of St. Louis.)

Tendon Surreflexivity and Contracture.—Tendon surreflexivity, as there has already been occasion to say, is not always accompanied by apparent functional disturbances. However, where it has attained a high degree of intensity, it is followed by contracture. The relation between surreflexivity and contracture is very clearly shown in the spastic paraplegia of Erb.

In common hemiplegia of cerebral origin the contracture appears when the exaggeration of the tendon reflexes has attained a certain degree of intensity.

We have already studied the state of the tendon reflexes in cases of tabes associated with organic hemiplegia, and the divers modes of association of the irreflexivity and the surreflexivity have been indicated. In such conditions the matter of contracture is principally related to the state of the tendon reflexes, as to whether the tabes precedes or follows the hemiplegia: in the parts where the reflexes are exaggerated there is usually contracture; contracture is always wanting in the parts where the reflexes are abolished.

From these facts it is legitimate to deduce the conclusion that some artificial procedure that would suppress the surreflexivity would be a means of overcoming the contracture. I expressed this idea in 1906 before the Neurological Society, in a discussion of intranervous injections of alcohol. I spoke in the following terms: "I have often asked myself in the presence of patients afflicted with paraplegia and intense contracture, in whom the muscular power seemed absolutely conserved, and the impotence due to the spasmodic state, whether it would not be legitimate to attempt to overcome the spasm by surgical intervention directed to the posterior roots of the cord, but a fear of accidents has always kept me from testing this idea."*

Two years later, Foerster had the merit to pass from the idea to

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its realization and to fix the technique of the operation that actually bears his name. It consists of section of some of the posterior roots of the cord in the lumbosacral region. In order to avoid the anesthesia that would result from the section of a series of three roots in a row, only one of two, or two of three roots should be cut.* Operating in this wise, the surreflexivity is followed by irreflexivity immediately after the operation, and this gives place soon to subreflexivity. The contracture yields in accord with the prevision. It is especially in Little's disease that this operation has been performed, and in many cases it has been crowned with success.** Thanks to it, patients, whose impotence was principally due to muscular rigidity, have been rendered able to walk. But it should be remembered that this intervention is not devoid of risks: we would avoid it if one day were discovered some substance capable of abolishing or of diminishing tendon reflexivity without exercising some other injurious effect on the organism.

From what has just been said, it results that common contracture such as is usually seen in lesions of the pyramidal tract, has close relations with exaggeration of the tendon reflexes, which seems to be the necessary condition, but which, be it understood, is not the condition which alone suffices to induce it.

But may there not develop also, in the course of affections in which the pyramidal tracts are implicated, some other form or kind of contracture which does not depend on tendon surreflexivity? This is now to be discussed.

To begin with, though I do not intend to make a detailed study of contracture, I shall try to give precision to the meaning of this term—indispensable to avoid ambiguity. We may express, I think, the idea of it generally entertained by saying that it is "stable pathological rigidity related to some mode of muscular activity." The word 'stable' does not imply that the rigidity can never disappear. Thus the rigidity of the limbs in the paraplegia of Pott's disease, sometimes equal to that of the spastic paraplegia of Erb, may be cured completely. It does not imply, either, that the rigidity is unchangeable throughout its duration; it is of a relative fixity: the contracture in the examples thus far chosen is subject to some fluctuations; it is not always of equal intensity; but in general it may be said that it has a certain stability [fixity].

*It is true that to follow this rule is only essential for territories like the plantar [bladder, rectum], the sensibility of which it is important to respect.

**Leighton and the translator are preparing for publication the report of a case of bullet wound of the cervical cord followed by intense flexor contracture of the lower extremities accompanied by constant pain, the patient having some muscular power, in which, after several months, all posterior lumbar roots were severed. The result has been almost ideal: the knee-jerks are absent, ankle-jerks present; hypesthesia in the areas of the lumbar roots, normal sensibility in legs and feet; normal bladder and rectal control; the patient walks with a lively gait, limping a little from some spasticity of the left lower limb.

This stability is in contrast with the instability of the rigidity observed in the divers affections that have been called 'spasms.' It is thus, for example, in so-called mental torticollis, which has also been called 'functional spasm of the neck,' in which the abnormal activity of the cervical muscles and the resulting stiffness are manifested only in an intermittent manner; the same is true of 'facial hemispasm.' However, the word 'spasmodic' is one of the terms that have been used to qualify an affection characterized by stable muscular rigidity, since the expression 'spasmodic tabes dorsalis,' established by usage, is applied to a form of paraplegia in which the contracture is remarkable for its fixity. In this there is a lack of precision of language which might lead to confusion in the mind of one not forewarned. Doubtless the two modes of muscular action that I have now in view may be associated; but it is none the less necessary to distinguish one from the other. I shall not insist further on this point in order not to go beyond the limits of my subject.

After these preliminaries we can more profitably discuss the question that has been put.

In infantile hemiplegia, which I have already discussed, two varieties of muscular rigidity may be observed. One is quite like the contracture of adult hemiplegia: it is stable, associated with tendon surreflexivity, and is related to a degeneration of the pyramidal bundle; the other has clinical analogies with the rigidity of Wilson's disease.* It comes nearer spasm than contracture; it is quite possible that it is due to an alteration of the central gray nuclei without implication of the pyramidal system, and for this reason there is no need to consider it further here.

On the contrary, I must discuss especially a variety of contracture to which I have called attention,** and which, owing to the end we have in view, merits a description. It is seen especially in the lower limbs, and it is one of the constituent elements of a kind of paraplegia which will be better understood in comparing it with the spastic paraplegia of Erb. The latter, let me recall, is characterized by the following phenomena: (a) Stable muscular rigidity in extension; (b) simple paresis, that is, mild weakness of voluntary power; (c) notable exaggeration of the tendon reflexes with ankle-clonus and sometimes dance of the patella; (d) reflexes of defense slightly exaggerated or about normal; (e) toe-sign.

*Dégénération lenticulaire progressive, maladie nerveuse familiale associée à la cirrhose du foie (*Revue neurologique*, No. 4, p. 229, 1912). In typical cases of this affection the tendon reflexes are not exaggerated and the pyramidal tracts are intact.

**Babinski: On a Form of Spasmodic Paraplegia Following Organic Lesion Without Degeneration of the Pyramidal System. (*Bull. et Mémoires de la Société médicale des Hôpitaux de Paris*, p. 342, 1899.

Spasmodic Organic Paraplegia with Flexor Contracture and Involuntary Muscular Contractions. (*Société de neurologie de Paris*, January 12th, 1911.)

Tendon Reflex Contracture and Skin-Reflex Contracture. (*Ibid.*, May 9th, 1912.)

Here follow the characteristics of the paraplegia I have in view: (a) Muscular rigidity in flexion, which at first, at times, yields completely or almost completely, but which later becomes stable; however, this fixity hardly attains the degree of that seen in the preceding form; it is subject to frequent variations that result from involuntary contractions of the muscles of the lower limbs; these contractions are usually slow; they cause alternate movements of flexion and extension, with predominance of action of the flexors; (b) profound disturbance of voluntary motion; there may be complete paralysis; (c) tendon reflexes exaggerated sometimes, but they may be normal, weak, or even abolished; (d) reflexes of defense always very lively; (e) in the large majority of cases, toe-sign. It may be added that the flexor rigidity, when it has become stable, is almost inevitably complicated with fibro-tendonous retractions.

I shall not go into details of the lesions which cause this form of paraplegia; suffice it to say that we have to deal usually either with diffuse sclerotic alterations of the cord, or with spinal compression by a tumor in the spinal canal, or with a pachymeningitis; besides, in cases of this kind, when they are well marked, secondary degeneration of the pyramidal tracts is wanting or very slight. At least this seems to be a just conclusion drawn from anatomoclinical observations thus far made.

I return to the clinical aspect. The muscular rigidity of this form of paraplegia is an actual contracture; it is pathological, due to a mode of muscular activity, and it is stable, at least at one period of its evolution. But, as we have just seen, the stability is less than that of the contracture of Erb's spastic paraplegia; it is interrupted by slow involuntary contractions that are true spasmodic movements, and in the initial phase the phenomenon should rather be placed in the category of spasm than in that of contracture. From this it follows that this variety of paraplegia merits the name of 'spasmodic' more than does the syndrome called 'spasmodic tabes dorsalis.'

The contracture under consideration, as we have just seen, has as its anatomical substratum lesions of the central nervous system; these lesions involve the pyramidal tract, disturbance of which shows during life in the toe-sign and in exaggeration of the reflexes of defense.

I am now in a position to reply to the question I put after having shown that common contracture associated with an alteration of the pyramidal tract has close relations with tendon surreflexivity. I can affirm that there also exists a contracture—different, it is true, from the preceding in form—caused by central nervous lesions involving the pyramidal tracts, but which is absolutely independent of tendon surreflexivity. In fact, in the patients that present it, the

tendon reflexes are not always exaggerated; far from it: they are often normal, weak, even exaggerated. The reflexes of defense, on the contrary, are not only always present, but they reach great intensity. My observations have been confirmed on every point by several neurologists.*

This form of contracture, especially common in the lower limbs, may simultaneously implicate the upper extremities, where it presents the same characteristics: rigidity with spasmodic movements, weakness or possibly abolition of tendon-bone reflexes, very lively reflexes of defense.

Whether regarded in the lower or upper limbs, that which is very striking is its intimate relationship with the cutaneous reflexes of defense on which it seems to depend, as the common form of contracture appears to depend on tendon surreflexivity. In order to bring out these features and to give these two forms of contracture—which may moreover be associated—names which distinguish them, I have proposed to call one form ‘tendon-reflex,’ the other ‘cutaneo-reflex.’

Tendon Reflexes and Hysteria.—Before concluding this study, I wish to examine a question that has been in controversy a long time, and concerning which it is important to have exact knowledge; I would speak of the influence that hysteria may have on the tendon and bone reflexes.

Not long ago neurologists admitted that hysteria was capable of disturbing tendon reflectivity; they were in accord in saying that the influence of hysteria showed itself in exaggerating all the tendon reflexes, while voluntary power remained normal; or in weakening, abolishing, or exaggerating the tendon reflexes in the members which hysteria had paralyzed or contracted. It was classical doctrine that hysterical hemiplegia and paraplegia manifested themselves with intrinsic characteristics identical with those of organic hemiplegia and organic paraplegia, and that extrinsic characteristics only could allow a differential diagnosis of the two kinds of disturbance.

I have maintained a diametrically opposite opinion for the last twenty years, my first work on this question dating from 1893.**

*Souques: Paraplégie spasmodique organique, avec contracture en flexion et exagération des réflexes cutanés de défense. (*Revue neurologique*, p. 376, 1911.)

Claude: Sur la paraplégie avec contracture en flexion. (*Revue neurologique*, p. 249, 1911.)

G. Etienne et E. Gelma: Paraplégie spinale en flexion. (*Nouvelle Iconographie de la Salpêtrière*, No. 5, 1911.)

Lion et J. Rolland: Paraplégie spasmodique avec contracture en flexion (type cutané-réflex de Babinski) dans un mal de Pott. (*Revue neurologique*, p. 843, 1912.)

Klippel et Monier-Vinard: Paraplégie avec contracture en flexion et exaltation des réflexes de défense. (*Revue neurologique*, p. 139, 1912.)

**Contracture organique et hysteria. (*Bull. et Mémoires de la Société médicale des hôpitaux de Paris*, May, 1893.)

I have many times returned to this subject, trying to demonstrate the inexactness of the traditional conception. At first my ideas met with lively opposition. At the present time, on the contrary, the majority of clinicians share my way of thinking. I therefore might justly hold the question to be settled and pass it in silence. However, as there are still some dissenting voices, I think it may not be without interest to indicate the causes of the error committed, and to show how I came to destroy it. (I shall only point out in passing the gross error consisting of taking for true ankle-clonus hysterical tremor, the movements of which are readily distinguished by their irregularity from those of true clonus.

Claude and Rose,* using the graphic method, have confirmed what I have said on this point.

The former error had its principal origin in imperfect ideas about the normal state of the tendon reflexes, in the paucity of semeiological data, and in a faulty method.

It is evident that without exact knowledge of the reflexes in the normal man, the varieties they may present, the features which permit recognition of surreflexivity, one would be exposed to gross errors. It is because there had been no determination of the whole scale of tendon reflexes in the physiological state—an indispensable preliminary to study of the reflexes in the pathological state—that hysteria was credited with the power to induce general surreflexivity. If a large number of subjects are compared, some in perfect health, others presenting hysterical manifestations and, of course, devoid of any other affection, no difference in the states of the tendon reflectivity in the two groups is observed. It is especially because the fruste ankle-clonus, a physiological phenomenon, was not distinguished from perfect ankle-clonus, a pathological phenomenon, that exaggeration of the tendon reflexes was considered a feature common to organic paraplegia and hysterical paraplegia. Moreover, if what I have said be recalled, it will be readily understood that hysterical contracture—in reality a simple voluntary contracture—when it affects the lower limbs, is likely to be accompanied by fruste ankle-clonus.

But it was perhaps the paucity of semeiotics that contributed most to foster erroneous ideas. Go back to the time when were unknown the signs now used in a routine way for diagnosis (the toe-sign, combined flexion of the trunk and thigh, sign of pronation, sign of Mendel-Bechterew, etc.). Then it was admitted that the extrinsic characteristics gave the only means of differentiating hysterical paralyses and organic paralyses: if a paraplegia or a hemiplegia came on in a young person, non-syphilitic, seeming to have a normal cardiovascular apparatus, who presented or had

**Etude graphique du clonus dans les maladies organiques et fonctionnelles du système nerveux.* (*Revue neurologique*, p. 829, 1906.)

presented hysterical manifestations, it was generally attributed to hysteria.

One may easily figure to oneself, with our present notions, the number of incorrect diagnoses of which such a rule must have been the cause; and, too, the consequences from our present point of view. After having unduly incorporated cases of organic paralysis in the domain of hysteria, it was necessary to admit that this neurosis could have, on the tendon reflexes, an action like that due to nervous lesions which engender paralyzes or contractures; this conclusion, moreover, was the more willingly accepted because hysteria, like some material agent, was credited with the faculty of localizing itself in divers parts of the brain, or of the cord, or in the nerves, and thus causing the same results as do organic alterations.

To-day, thanks to the new signs that we possess, we are not exposed to such error. But even before these signs were known, it was possible for me to correct the ideas then generally entertained. Here are the facts on which I based my opinion. They were, on the one hand, repeated experiments, on a large number of hysterical subjects that were suggestionable and hypnotizable. These experiments proved to me that suggestion, no matter what its form or its duration, was without action on the tendon reflexes; that it could not weaken, nor abolish, nor exaggerate them.

Provoke by suggestion an hysterical monoplegia, hemiplegia, or paraplegia; then try by all possible psychic means to augment the intensity of the reflexes in the paralyzed members, or to cause them to disappear, and it will be useless; you will fail in all your efforts.

On the other hand, it is from numerous observations that the notion has arisen that paralyzes accompanied by irreflectivity or by surrelectivity do not get well under the influence of counter suggestion; this may attenuate them, it is true, when there is an hysterico-organic association, but it never causes them [paralyzes] to disappear completely, and, in any case, it brings about no modification of the tendon reflexes.

However, since the experience of a single observer, no matter how extensive, is still limited, I invited those, who had thought that they had seen facts in opposition with my conception, to present them. I expressed myself as follows on this subject before the International Medical Congress of 1900, on the occasion of a report on "the diagnosis of organic hemiplegia and of hysterical hemiplegia":

"I do not believe that in pure hysterical hemiplegia there can be, as in organic hemiplegia, exaggeration of the tendon reflexes on the paralyzed side. An hysteric can, it is true, in certain cases, execute voluntarily, following percussion of the patellar tendon, a movement more energetic on the affected side than on the sound side, and thus simulate, if one is not on guard, an exaggeration of

the reflexes; but one can generally distinguish this pseudo-reflex from the true reflex by means of the characteristics I have indicated. I add that in such a case it is usually only the knee-jerk that seems exaggerated, while the other tendon and bone reflexes—the ankle-jerk, the radial reflex, the elbow-jerk—are equal on the two sides, contrary to what is found in organic hemiplegia. I am not ignorant of the fact that certain physicians state that they have seen unilateral exaggeration of all the tendon reflexes in hysterical hemiplegia, but I declare that I have never seen such a thing, and I am convinced that in the cases reported there were hysterio-organic associations. In order to establish that exaggeration of the tendon reflexes depends on hysteria, it must be proved, in a given case, on the one hand, that the paralysis, by reason of its mode of evolution and the effect of suggestion on it, is due exclusively to hysteria; on the other hand, that the exaggeration of the tendon reflexes, disappearing with the paralysis, must be intimately bound to the hysteria.

“It is to be desired that neurologists who admit the possibility of exaggeration of the tendon reflexes in hysterical hemiplegia kindly consent to show their colleagues such patients, for it is only, as it were, by material demonstration that an agreement can be reached.”*

The years have passed without the presentation of a single case of this kind, and in 1908, in the discussion on hysteria at the Neurological Society of Paris, there was no one to defend the ancient thesis.

In 1909, apropos of a work by Ettore Levi, entitled “Some New Facts Relative to a Case of Hysteria with Great Exaggeration of the Tendon Reflexes,” I wrote the following lines: “If it be true, as Mr. Levi pretends, that in France a large number of my colleagues are not of my opinion, and if there be still Parisian neurologists really convinced that hysteria can exaggerate the tendon reflexes, why do they not demonstrate the fact? Nothing should be easier; for the proof of a positive fact is readily made. If it is impossible for us to appreciate the exact value of the observations made on patients like those of Mr. Levi, which we have not seen, we should be absolutely forced to bow before clear facts were they placed before us.

“If, for example, there be presented a case having hysterical hemiplegia with unilateral exaggeration, well defined, of the tendon reflexes, and if after cure, by psychotherapeutic procedures, a return of the reflexes to normal be observed, I should be obliged to recognize that I have been in error. But up to the present time, although the question has been put for more than ten years, no one has been able to show such a fact to the Neurological Society of

**Revue neurologique*, p. 77, 1900.

Paris, in spite of the immense amount of material at disposal here; or, rather, this is what has happened: there have been presented, with the label of hysteria, some hemiplegics and some paraplegics whose tendon reflexes were manifestly exaggerated, and who presented perfect clonus, but none of them has been seen a second time, cured of this affection; and, as for the most of them, those who presented them have returned later loyally to acknowledge that they had made errors in diagnosis."

These reflexions retain all their force, for in the course of the three succeeding years not a single fact has been recorded to invalidate my opinion.

Therefore the question seems to me to be definitely settled. From the clinical point of view, it was necessary to settle it, and it was for this reason that I pursued its study with perseverance through many years.

(THE END.)

MEDICAL AND SURGICAL PROGRESS.

ANTERIOR POLIOMYELITIS.

A REVIEW OF THE RECENT LITERATURE IN REGARD TO THE EPI-
DEMOLOGY, ETIOLOGY, MODES OF TRANSMISSION, BAC-
TERIOLOGY AND PATHOLOGY. ITS CLINICAL
MANIFESTATIONS AND ITS TREATMENT.

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SECTION III.—CLINICAL.

146. Walton: Anterior Poliomyelitis in the Adult, with Illustrative Cases. (*Boston Med. and Surg. Journ.*, November 28th, 1907.)
147. Symposium on Poliomyelitis. Med. Soc. of the State of Pennsylvania, September, 1908. (*Journ. Amer. Med. Assoc.*, Vol. LI, No. 19, November 7th, 1908.)
148. Climenko: Clinical Study of the Etiology of Acute Anterior Poliomyelitis. (*Long Island Med. Journ.*, December, 1907.)
149. Ager: Symptoms in the Acute Stage of Anterior Poliomyelitis. (*Long Island Med. Journ.*, December 1907.)
150. Browning: Sensory Elements in Anterior Poliomyelitis. (*Long Island Med. Journ.*, December, 1907.)
151. Lovett and Lucas: A Study of Six Hundred and Thirty-five Cases of Infantile Paralysis. (*Journ. Amer. Med. Assoc.*, Vol. LI, November 14th, 1908.)
152. Lhermitte: Multiplicity of Symptoms and Lesions of So-Called Epidemic Anterior Poliomyelitis. (*Semaine Méd.*, November 24th, 1909.)
153. Ball: The New Disease—Epidemic Paralysis. (*St. Paul Med. Journ.*, December, 1909.)
154. Morse: Infantile Paralysis—Spinal Form. (*Amer. Journ. Dis. Children*, Vol. 2, August, 1911.)
155. Anterior Poliomyelitis—Infantile Paralysis. (*Journ. Amer. Med. Assoc.*, Vol. LVII, No. 9, August 26th, 1911.)
156. Frissell: Report of a Case of Epidemic Anterior Poliomyelitis. (*Journ. Amer. Med. Assoc.*, Vol. LVI, No. 9, March, 1911.)
157. Koplik: Cerebral Forms of Poliomyelitis and Their Diagnosis from Forms of Meningitis. (*Amer. Journ. Med. Sciences*, June, 1911.)

158. Morse: Acute Poliomyeloencephalitis (Infantile Paralysis). (*Boston Med. and Surg. Journ.*, Vol. CLXIV, No. 2, January 12th, 1911.)
159. Mueller: Epidemic Poliomyelitis with Bulbar Symptoms. (*Muench. med. Wochenschr.*, Vol. LIX, No. 4, January 23rd, 1912.)
160. Colliver: A New Preparalytic Symptom of Poliomyelitis. (*Journ. Amer. Med. Assoc.*, Vol. LX, No. 11, March 15th, 1913.)
161. Sharp: The Differential Diagnosis Between Acute Epidemic Poliomyelitis and Affections Having Poliomyelitis Syndromes. (*Interstate Med. Journ.*, p. 824, 1913.)
162. Wachenheim: Atypical Infantile Paralysis. (*New York Med. Journ.*, November 8th, 1913.)
163. Monrad: Diagnosis of Epidemic Poliomyelitis and Treatment in Acute Stage. (*Ugeskrift for Laeger*, Vol. LXXVI, No. 2, January 8th, 1914.)

Walton (146) states that acute or subacute poliomyelitis in young adults is not rare. The onset of the paralysis is more retarded in adults than in infants, and the extension of paralysis from one group to the other is less immediate. No extension of the paralysis is to be expected after the fever has subsided. He states that symptoms of the disease in the adult are overlooked because this diagnosis does not enter the mind of the physician in case the patient is an adult, whereas it is ever present when the patient is a child.

At a meeting of the Pennsylvania State Medical Society in September, 1908 (147), McKee stated that the onus of future clinical study of this disease rested largely on the family physician. When a young child is suddenly seized in the warm months of the year with moderate fever, vomiting, constipation or diarrhea, pain in the back and legs, some stiffness of the spine, sweating and possibly some disturbance of the consciousness, infantile paralysis must be thought of. Mills stated that cases called poliomyelitis, which occurred after ordinary febrile diseases, were not of the same character. He believed that the disease might be poliomyelitis, but that there might be associated with a true poliomyelitis symptoms indicative of the occurrence of a root neuritis, or of a form of truncal neuritis. Cerebral symptoms do occur, and are due to an associated polioencephalitis. Kane stated that he had had one case which was operated on for intestinal obstruction, in which poliomyelitis was suspected before operation. The child died a few days later of paralysis of respiration.

Climenko (148) reviews the history of recorded epidemics, and states that he believes from a study of 187 cases that the condition is due to a toxemia, and that since 43 per cent. of the cases showed gastro-intestinal disturbances, the gastro-intestinal canal is the probable port of entry.

Ager (149) states that there is every reason to believe that the earliest manifestation of infection is always found in the gastro-enteric tract, accompanied by fever. Pain and tenderness are common symptoms. Besides the ordinary mild type, he speaks of two other types; one mild, in which the paralysis is found only in some unusual muscle group, *e. g.*, the deep muscles of the back, and another severe, in which the infection is so high in the cord that

the case resembles acute meningitis, with opisthotonos, convulsions, irregular and sluggish pupils, severe headache, head rolling, sharp cries, and periods of coma.

Browning (150) discusses the sensory symptoms under three heads: Gross sensory disturbances, paresthesias and pain. The early pain is a hyperalgesia of peripheral distributions, sensitive soles, etc. There is also a purely spinal pain, seemingly dependent on the extent to which the spinal meninges are involved, which is greatly increased by movements of the spinal column. Another form is a distinct tenderness all along the spinal column, favorably influenced by local counterirritation. Then there is the soreness and tenderness that comes on after the acute stage has passed, and is wholly peripheral in site, having its seat principally in the affected muscles. This is of service in prognosis, as indicating the extent of muscular involvement.

Collins and Romeiser (47) state that from an analysis of 500 cases observed in New York in 1907 there were all possible degrees and combinations of paralysis. Two isolated facial 'nuclear' paralysees were observed. Paralysis of the diaphragm was seen in one case only. The common meningeal symptoms were somnolence, stupor, rigidity of the neck, retraction of the head, twitching of the face and of the extremities, both in the waking and sleeping state, sudden starting and screaming and occasional convulsions. Occasionally there is unconsciousness, convulsions or delirium for a short time, and in a few instances opisthotonos. In regard to the gastro-intestinal symptoms, vomiting was the most common, and constipation was twice as common as diarrhea. A triad of symptoms to which they call special attention is abdominal paralysis, retention of urine and constipation. Incontinence of urine was never permanent. No definite relation was observed between the degree or duration of fever and the severity of, or extent of the paralysis, but it was distinctly made out that in all quadriplegias there had been a distinct febrile stage, whereas it was chiefly in the monoplegias that a history of 'no fever' or 'slight' was obtained.

The disease at its onset develops with and without warning, but usually with vomiting and fever. In many cases the child had gone to sleep apparently well. Sometimes the paralysis was evident the next morning, but came on usually two to four days later. As the somnolence, pain, and hyperesthesia are accompanied in many cases by immobility, it is often days, and sometimes a week, before the paralysis is noted.

Lovett and Lucas (151) from a study of 635 cases of infantile paralysis, state that it appears from a study of their data that a severe onset is more likely to be followed by a severe paralysis than by any other type. A moderate attack is most often followed by a moderate paralysis, with a greater tendency to a severe than a light form. A slight attack shows about the same tendency to be followed by a moderate or slight paralysis. Cases in which no onset is noted are most often followed by slight or moderate paralysis, with little tendency to the severe type. Their figures show paralysis of one leg to be nearly four times as common as paralysis of both legs, and paralysis of an arm and leg of the same side to be more common than crossed paralysis. In regard to the individual muscles, a study of 478 cases showed that the internal muscles are affected more frequently than the external, and the anterior more

often than the posterior. The quadriceps muscle was the one most commonly affected. The tibialis anticus and anterior muscles of the lower leg came next in frequency, and the short toe flexors were the least likely of all to be affected. The anterior muscles of the thigh are affected much more frequently than the posterior hamstring muscles. When only one hamstring muscle is affected, it is more often the internal than the external. The sartorius muscle frequently escapes when the quadriceps femoris is paralyzed. The internal rotators of the thigh are more frequently affected than the external rotators, and the adductors of the thigh are more frequently involved than the abductors. Paralysis of the upper arm was much more frequent than paralysis of the forearm, the deltoid apparently suffering most frequently, often in connection with the biceps, triceps, or scapular muscles. Paralysis of the forearm was comparatively uncommon. In general, the paralysis was more often symmetrical than asymmetrical, when both sides were affected.

Shidler (51) states that in the epidemic in Nebraska in 1909 the common symptoms were as follow: Sudden onset, moderate fever, tired feeling, change in disposition, constipation, or less often diarrhea; vomiting in a few cases. The reflexes were generally sharp or exaggerated during the fever, and absent after the fever in paralytic cases. Often there are pink lines under the eyes, running from the inner canthus outward and downward to the malar bone. There is usually some stiffness of the neck muscles, occasionally slight retraction of the head, even in mild cases. Under subjective symptoms, a basilar headache comes first and most important. It is almost constant. There is often pain in the back of the neck. General hyperesthesia of the back and limbs is frequently present. In the more marked cases, and as the disease progresses to the second, third, or fourth day, or to the temperature crisis, there is generally a modified Kernig's sign present in that flexion of the thigh on the body with extended leg will give unusual pain under the knee in the hamstrings. Often the leg cannot be straightened even with the back bent. The thigh may be flexed on the body with the knee bent. Especially is this sign present if the limbs are to be paralyzed. Among the unusual symptoms noted in over 200 cases were strabismus once, opisthotonos several times, formication once, numbness once, photophobia once, sphincteric paralysis thrice, and bulbar paralysis.

Lhermitte (152) states that the reports of various epidemics of this disease include various inflammatory affections of the nervous system and meninges, including simple or hemorrhagic polioencephalitis, diffuse encephalitis, diffuse myelitis, meningomyelitis, meningo-radculitis, and polyneuritis, all of which have been reported as true poliomyelitis. A paralysis of meningeal origin, he states, can be differentiated from paralysis of anterior poliomyelitis by the meningeal symptoms: lymphocytosis or polynucleosis in the cerebrospinal fluid, severe pain in the limbs, the slower retrogression of the paralysis, and the absence of consecutive atrophy of the muscles involved.

Ball (153) suggests the name "The New Disease—Epidemic Paralysis" as best covering the different types of anterior poliomyelitis in its epidemic form.

The Massachusetts State Board of Health (67) speaks of the

symptomatology of infantile paralysis, and states that if we think of it as a poliomyeloencephalitis, with meningeal complications, and appreciate the fact that the disease may affect any and all parts of the gray matter of the central nervous system, and in all possible combinations, it may be easier to understand the innumerable manifestations of the disease, and it is less likely to be overlooked and mistaken for other conditions.

The best classification is that of Wickman, which is as follows:—

1. Ordinary spinal paralysis—*anterior poliomyelitis*.
2. Progressive paralysis; usually ascending, less often, descending; *Landry's paralysis*.
3. Bulbar paralysis; *polioencephalitis of pons*.
4. Acute encephalitis, giving spastic monoplegia or hemiplegia.
5. Ataxic type.
6. Meningitic type.
7. Polyneuritic—multiple neuritic type.
8. Abortive type.

There is in a vast majority of cases nothing characteristic about the onset. In many instances, gastro-intestinal symptoms predominate; while in others, those referable to the respiratory tract are most marked. Sweating, marked nervous instability and general hyperesthesia are present in many instances before the onset of the paralysis, but they are not at all constant. Their presence points strongly toward the disease, but their absence does not count against it. It is safe to say that at present there is nothing about the early symptoms to justify a positive diagnosis of infantile paralysis before the onset of the paralysis.

The abortive type means those cases in which there has never been any paralysis, which do occur, probably as frequently as those which do have the paralysis, and which probably act as carriers in the spread of the disease.

The *ordinary spinal type* is the one usually seen, where the paralysis reaches its maximum in from a few hours to three or four days, followed by a stationary period of several weeks, which in time is followed by a period of improvement; the final paralysis always being less than the original. It is impossible to prophesy in the acute stage how extensive the final paralysis will be.

Progressive Type.—In this type the paralysis appears usually first in the legs, and gradually extends upward. In rare instances, it appears first in the arms, extends downwards, and finally upwards to the muscles supplied by the medulla. It is probable that the great majority of the cases that have in the past been described as *Landry's paralysis* really were examples of this type. When the paralysis reaches the external muscles of respiration, as it very often does, death is practically inevitable, and usually occurs on the third or fourth day.

The Bulbar Type.—Cases of this type have in the past usually been designated as *polioencephalitis superior* or *inferior*, according to which of the cranial nerve nuclei were involved. The nuclei may be affected singly or in all possible combinations. The facial and abducens nerves are those most often affected. There may be paralysis of deglutition and of the muscles of the larynx. When the vagus is involved, there are disturbances of respiration and of the cardiac action. Involvement of one or more of the cranial nerve

nuclei is not very uncommon in connection with the ordinary spinal type of infantile paralysis.

Acute Encephalitic Type.—The symptoms resemble those of acute meningitis, the deep reflexes are as a rule exaggerated, and the paralysis is spastic. The diagnosis is usually impossible without a lumbar puncture.

The Ataxic Type.—Ataxia is a prominent symptom in a certain number of cases. In a few, it is the only nervous symptom; in others, it is associated with paralysis of the cranial nerves and sometimes with a small amount of spinal paralysis. The ataxia is often distinctly of the cerebellar type.

The Meningitic Type.—Symptoms of meningeal irritation are not at all uncommon in the early stages of all types of infantile paralysis. These are so marked in many cases that they present the typical picture of meningitis. Headache, rigidity of the neck and back, vomiting, tonic and clonic spasms, strabismus, Kernig's sign, delirium, and coma may be present in all combinations. In such cases, the diagnosis must rest until the appearance of flaccid paralysis. A positive diagnosis may be made only following a lumbar puncture.

The Polyneuritic Type.—Pain is a prominent symptom in many cases. It is sometimes located in the joints, but is more often along the nerve trunks, or indefinite in its distribution. It is usually most marked over the paralyzed parts. The pain and tenderness are sometimes marked enough to cause the paralysis to be overlooked, and a diagnosis of rheumatism or scorbutus made.

Frissell (156) reports the first case where Flexner followed the corresponding reaction of the spinal fluid in man, as found by him in the spinal fluid of infected monkeys. The diagnosis was made by examination of the spinal fluid, before the onset of the paralysis. This fluid showed an excess of lymphocytes, and a marked protein reaction; and later, after the onset of the paralysis, there was still an excess of lymphocytes, but the supernatant fluid showed a diminished reaction for protein.

Koplik (157) describes a form of poliomyelitis, which he says is constantly mistaken for meningitis, of the acute cerebrospinal suppurative form, or the subacute tuberculous form. The onset of the disease is acute, and begins with a history of previous good health. After the acute symptoms set in, there may in some cases be an abatement, and then a recurrence of symptoms of a cerebral nature, which gradually increase. If the case is one resembling acute meningitis, the symptoms are more active, with neck rigidity, pain in the neck, headache, and delirium. If the case resembles the tuberculous form of meningitis, the patient is more quiet, exhibits paralyzes of the cranial nerves, and may even have marked hydrocephalus with distinct Cheyne-Stokes respiration and unconsciousness. In both sets of cases, the delirium, sopor, or coma, lightens, the patient after a week or more of illness becoming brighter, and recovery proceeds.

He states that the main points to have in mind are the great similarity of a certain set of these cases to those of tuberculous meningitis, and the absolute futility of a positive diagnosis without study and a lumbar puncture.

The Washington State Board of Health (66) states that it is essential that the description of this disease be revised, not only in

regard to the symptomatology of the paralytic stage, but also to the symptoms of onset. The 'morning paralysis' of West (*i. e.*, a child with hardly any previous symptoms of discomfort wakes up paralyzed) used to be considered a typical representative of the disease. During epidemics this form is extremely rare. A diagnosis before the development of the paralysis is the aim of the physician of to-day, because this early diagnosis means isolation.

This report also speaks of the necessity of efficient and compulsory quarantine for three weeks, with isolation of the patient, and members of the family should be excluded from schools and public assemblages, particularly where they would of necessity come into close contact with children.

Mueller (159) encountered a number of cases of poliomyelitis where the paralysis was confined to the medulla oblongata, or was localized predominantly there. The disease began with merely unilateral facial paralysis and fever. He found the facial nerve involved in 21 of his 165 cases of recent poliomyelitis. Generally there were other bulbar and finally spinal symptoms, including paralysis of the external ocular muscles, of the hypoglossal and motor trifacial nerve, disturbances in speech and swallowing, or unilateral paralysis of the palate. The prognosis is grave in these descending spinal cases. The typical febrile prodromes with hypersensitiveness and sweats were occasionally noted in the bulbar form. The hyperesthesia is an early and possibly fleeting symptom, but is so characteristic, in connection with the lack of brain symptoms of meningitis, that Mueller has frequently based his diagnosis on it alone, before any paralysis has developed.

Colliver (160) speaks of a new preparalytic symptom in infantile paralysis, which he observed in 16 cases in a recent epidemic in Los Angeles, California. This symptom is a peculiar twitching, tremulous or convulsive movement of certain groups of muscles lasting from a few seconds to less than a minute. The amplitude of vibration is greater than a tremor, not so constant and long as a convulsion, and more regular than mere twitching; yet it has some elements of all of these. It usually affects a part or whole of one or more limbs, of the face or jaw, but it may sometimes affect the whole body. The condition is often accompanied by a cry similar to the hydrocephalic. At times there is a slight convulsive movement, just like a chill, as mothers say, during which time the child is apparently unconscious, with the eyes set for a few seconds, after which he apparently becomes normal again. Colliver has observed it as a twitching of the lip with tongue running in and out and a working of the jaw, preceding bulbar cases.

Sharp (161) states that the differential diagnosis between acute poliomyelitis and acute myelitis, polyneuritis, and some forms of meningitis or meningomyelitis, may be very difficult, if not impossible, clinically. The same motor and meningeal symptoms that occur in epidemic poliomyelitis may also occur during the course of some of the other acute infectious diseases; notably measles, scarlet fever, influenza, variola, erysipelas. He states that cases of tuberculous meningitis occurring during a poliomyelitis epidemic present many difficulties in the immediate diagnosis; and even the examination of the cerebrospinal fluid may not at once be decisive. The diagnosis between poliomyelitis and polyneuritis may be difficult without lumbar puncture, as many of the typical epidemic

poliomyelitis cases have severe pains and tenderness in the extremities. If the meningitis symptoms are very severe, it usually indicates poliomyelitis rather than neuritis.

He also states that there is no condition of the spinal fluid which is positively diagnostic of epidemic poliomyelitis; but the examination is of value in eliminating such diseases as tuberculous meningitis, cerebrospinal meningitis, etc.

Wachenheim (162) called attention to the large proportion of atypical cases of infantile paralysis seen in New York City since the epidemic of 1907. He reported in detail 6 cases, one with a temperature of 106° F., and all the others with severe cerebral symptoms, and with deep somnolence. Localized facial sweating occurred in one case. Another case showed prolonged subfebrile temperature with tachycardia lasting seven weeks. Another case resembled pure meningitis.

Monrad (163) states that epidemic poliomyelitis is wrongly diagnosed as a dislocation of the humerus, or hip-joint, or fracture. He states that it may be confused with acute rheumatism, meningitis, appendicitis, and polyneuritis. The mortality seems to be higher for older children and adults, and the fourth day seems to be the critical one.

(TO BE CONCLUDED.)

SOME RECENT LITERATURE ON CRIMINAL ANTHROPOLOGY AND ALLIED BRANCHES.

A REVIEW OF RECENT LITERATURE.

By SIDNEY I. SCHWAB, M. D., of the Editorial Staff.

1. Hertwig: The Present State of the Sexual Problems with Personal Investigations. (*Biolog. Zentralbl.*, Bd., XXXII, No. 2, p. 65, 1912.)
2. Hammer: The Mendelian Inheritance in Man. (*Med. Klin.*, No. 25, p. 1033, 1912.)
3. Sommer: Report of the Second Congress for the Study of Genealogy, Inheritance and Regeneration, Giessen, April 9th-13th, 1912. (*Klinik fuer psych. und nerv. Krankh.*, Bd. VII, Hft. 3-4, pp. 193, 291, 1912.)
4. Rohleder: Monographien ueber die Zeugung beim Menschen. II. Die Zeugung unter Blutsverwandten. Leipzig. G. Thieme.
5. Mayer: The Question of the Increase of Nervous and Mental Diseases. (*Deutsch. militærærztl. Zeitschr.*, No. 23, p. 881, 1912.)
6. Fehlinger: English Laws Against Immorality. (*Sexual-Probleme*, p. 262, April, 1912.)
Industry and Criminality Among Woman and Children in the United States. (*Archiv fuer Kriminalanthrop.*, Bd. 49, Hft. 3 and 4, p. 196, 1912.)
7. Kusnetzoff: Anonymous Letter-writing. (Inaug. Dissert., Munich.)
8. Goronzek: The Tattooing of Soldiers. (Inaug. Dissert., Königsberg.)
9. Monkemoller: The Psychopathology of Pyromaniacs. (*Archiv fuer Kriminalanthrop.*, Bd. 48, Hft. 3-4, p. 193, 1912.)
10. Mariet: The Education of the Police in the Matter of Psycho-Psychiatry. (*Schweizer. Zeitschr. fuer Strafrecht.*, Hft. 1, p. 61, 1912.)
11. Hermann: The Moral Perception and Understanding of Imbeciles and Criminal Degenerates. A Contribution to the Question of So-called Moral Insanity and Including the Pedagogical and Punitive Treatment of Degenerates. (*Juristisch-psychiatr. Grenzfragen*, Bd. VIII, Hft. 4-5, 1912.)
12. Keller: What is the Object of an Island Institution for the Anti-Social, Weak-Minded Men? (*Monatsschr. fuer Kriminalpsychol.*, 9, Jahrg., Hft. 1, p. 1.)
13. Heindl: The Penal Island of New Caledonia. (*Archiv fuer Kriminalanthrop.*, Bd. 50, Hft. 3-4, p. 247, 1912.)

14. Egenberger: The Colony for Education and Work for the Weak-Minded as a Means of Segregating the Incurable so as to Prevent Their Dessimation Among the People. (*Friedreich's Blätter fuer gerichtl. Medizin*, July-August, p. 241, 1912.)
15. Maier: The Education of the Police in the Matter of Psycho-
Psychiatry. (*Schweizer. Zeitschr. fuer Strafrecht.*, Hft. 1, p. 61, 1912.)
16. Daniel: Some Statistics About Sterilization of the Insane. (*Journ. Mental Science*, Vol. LVIII, No. 1, p. 62, 1912.)
17. Pfeiffer: Ueber den Selbstmord. Pathologisch-anatomische und gerichtlich. medizinische Studie. Jena. G. Fischer.
18. Wassermeyer: As Regards Suicide. (*Archiv fuer Psychiatrie*, Bd. 50, Hft. 1, p. 255, 1912.)

In the yearly review of the progress and activity of neurology and psychiatry for the year 1912 more than 850 references were devoted to the consideration of the literature on criminal anthropology. This enormous activity in respect to the subject heretofore very much neglected by physicians points to the advantage which might result to the general medical reader by attempting to awaken his interest in this very important field of social medicine. The problems clustering around this subject are varied and numerous, including theories of inheritance, criminology, the study of degenerates, the care of the insane and the various legal questions involved in the proper handling, trial and the after-care of the insane criminal. It might be worth while, therefore, to go over this vast amount of literature and point out some of the general tendencies and methods by which the solution of the gravest of these problems might be approached.

The subject of inheritance lies very close to an understanding of the criminal type, and it is not to be wondered at, therefore, that Kotscher, who is the referat of this subject in the *Jahresbericht*, should devote considerable space to a consideration of some of the recent work on the problems of inheritance. He calls attention particularly to the important experimental and biological study of Hertwig who comes to the conclusion that the sexual characteristics are probably contained in the generative cells, but can be affected by external causes. He points out further that the changeability of the sexual chromosomes are different in the animal and in the plant world. In most instances it appears that the sexual character is firmly implanted in the sexual cells and that the mechanism of the development of the sexual characteristics follows without influence from the external world. This, of course, necessitates the conclusion that there cannot exist any volitional determination of sex. In regard to the Mendelian laws of inheritance, Hertwig is extremely uncertain especially, and particularly mentions the existence of secondary sexual characteristics.

Hammer, in an article on the Mendelian laws in respect to human beings, arrives at the conclusion that there are many facts in human pathology which seem to support the Mendelian theories. An important fact is that in human beings the dominant characteristics are always in evidence. The question how abnormalities first make their appearance is not clear.

Sommer, of Giessen, has inaugurated a very interesting method

of studying the questions which concern the subject here reviewed. He has conducted a course and a Congress for the study of the theories of inheritance and regeneration and for the investigation of the problems which concern the family. This effort is concerned with the idea of determining methods by which health in a mental and physical way may be offered to the unusual types, particularly with respect to the peculiarities of race and family. Although this may seem at first sight to be an attempted specialization, yet the Congress is sufficiently broad in its limits to use whatever means may be of assistance, particularly medical and social forces, which the individual may take advantage of. Their idea is not to be concerned only with pathology, but also to determine the limits of the normal. The yearly appearance of the work of this Congress should be a valuable addition to our knowledge on the subject.

Rohleder has made a careful study of the subject of the offspring of blood relations. He believes that the intermarriage of closely related individuals has fixed a characteristic of the race. Accordingly, such intermarriages are an important factor in race culture. He does not believe that the disadvantages of blood relations are necessarily as pronounced as has been believed, but it is necessary to terminate such intermarriages at some stage, or they will lead to the final destruction of the race. This idea of Rohleder's necessarily tends to modify the legal aspects of incest which has grown up to be a tradition of the human race.

Mayer has set before himself the task of investigating the basis for the assertion that decadence is increasing at the present time. A critical study of the statistics has led to the following results. (The basis of the study was chiefly upon the statistics of the Army.)

(1) It is possible to determine that there is a great increase in the number of those suffering from nervous and mental diseases. There has also been a striking increase in the number of individuals who are not fit for army service for these reasons. Whether there is an actual increase in the number, or whether the increase is an apparent one due to deeper knowledge of certain diseases cannot be determined. (2) There are at the present time more cases of mental disease coming under medical care than formerly. (3) In studying the number of mental cases in the army, it is interesting to note that there are twice as many declared mentally unsound than is the case with the rest of the population. (4) There is some difference in Germany, at any rate, between the south and middle Germany and the territory of the Rhine. Probably other factors, such as industrial conditions, come into the question here. (5) Suicide in the army is less frequent than formerly, and is now about equal to the percentage in the male civil population. The final conclusions of this study are as follow: First, the chief causes, alcoholism and syphilis, have not tended to increase in the last decennium. On the other hand, an unfavorable influence, dependent upon the increase in culture in general, has tended to become more frequent, such as neurasthenia, paralysis, etc. Second, as a proof of the increasing number of mental and nervous diseases, the following should not be given undue weight: The increase of suicides, the increase in insane asylums and hospitals for the care of the insane, nor for the increase in the number of such individuals according to the census reports, or statistics of the army, for the reason that as our knowledge becomes deeper, the number of cases

would tend to increase in proportion. Taking the question altogether, the impression seems justified that civilization, especially in Germany, puts more of a pressure upon the people living away from the cities and there results a loading up of the nervous system, and, as a result of that, a weakness and lack of resistance against external harmful factors, such as syphilis and alcoholism. In addition, a weakened predisposition appears to be capable of being carried on as an unfavorable quality.

Fehlinger, quoting from the report of Annie E. McCord, a special agent of the Bureau of Labor at Washington, on the study of the statistical tables, to see if work in the trades had an influence on the causation of criminality in women and children, the result was an entirely negative one; there was no proof brought forward that there was any direct relationship between the kind of work children and women pursued and the amount of criminality.

Kusnetzoff considers the study of the writers of anonymous letters in regard to the psychical condition of the writer. The following are some of his conclusions: In the male sex, writers of anonymous letters are found at an early age. A number of pathological mental states are found among them—idiocy, imbecility, and likewise epileptic disturbances of the mind. In the case of an adult who was found to be the writer of an anonymous letter containing threats, scandal, and so on, there is often found a condition of psychical degeneracy, hysteria, or senile psychosis. The writers of anonymous letters concerned with swindling plans and blackmail chiefly belong to the criminal types. In women writers of anonymous letters, the purpose is found to be chiefly revenge, admiration, erotic tendencies, etc. Particular attention must be given to the question of lessened responsibility through menstrual anomalies, pregnancy and diseases; likewise the climacteric and senile changes. In a study of the handwriting, to determine whether it showed any evidence of mental disease, nothing positive was obtained.

Goronzek, investigating the subject of tattooing in 7,145 soldiers, 7 per cent. of these were found to be tattooed. His conclusions are as follow: First, he found that there was a higher percentage of tattooed soldiers who were subject to punishment than those who were not; second, the tattooing was performed rather seldom during the period of service; third, there was no difference found in the kind of tattooing between the criminal and normal types, in those that were healthy and those that were not; fourth, the pictures were chosen without any plans, and there is no conclusion to be derived from their character as far as the reputation, or tendency to criminality of the individual is concerned; fifth, tattooing in childhood is purely an imitation impulse; sixth, tattooing cannot be considered as one of the signs of degeneracy.

Monkemoller, in a very careful study of the statistical survey on the subject of the psychopathology of pyromania, comes to the following conclusions: The tendency towards pyromania can be based upon the most varied psychical affections and may arise from many normal pathological motives. There is to be noted a certain increase in the time of puberty, and the female sex at this time seems to incline more to this form of criminality. There is no evidence, however, that the number of cases are found increased at this time. In the cases of most pathological pyromaniacs a certain

psychical disturbance can be found. In a great many cases normal motives can be demonstrated. It is shown that incendiarism is one of the easiest methods of revenge. It must not be forgotten that the motive of revenge can act with equal force upon an abnormal as well as a normal individual.

Mariet, in a very careful study of 10 cases, gives the following divisions on the subject of vagabondage: The primitive constitutional vagabondage with much moral inversion, instability and indifference, and that as a result of obsessions and impulses. In all cases there lies at the bottom a degeneration with pathological impulses. Such impulses can exist constantly, or can make themselves intermittently felt. In cases of the constitutional vagabond, however, the impulse to wander is continuously present. The impulse to wander can be rooted primarily in the sphere of feeling. It can also be the result of an idea which is bound in a secondary fashion to the emotions. The ordinary means of restraint are not effective in cases of vagabondage. The psychical defect which forms its foundation shows itself already in childhood, and must here be combated; the family, teacher, and physician must work together. The physician must determine the psychical status in the case of every student, and with every abnormality must strike a psychical balance upon which must be determined the rules for his education. In cases of constitutional vagabondage there must be found special institutions where they can be kept and cared for. This is the most important demand of the future.

Hermann takes up the question of moral insanity and the pedagogical and punitive treatment of the degenerates. In 800 cases 29 showed degeneracy without any defect in the intelligence and showed no condition of imbecility, or idiocy. Thirteen of these cases are reported and discussed. He does not think it altogether justified to regard the lack of feeling and the dulled moral conception of a degenerate criminal as evidence of moral idiocy; it is necessary to determine whether there is any defect of intelligence.

Keller gives an account of an interesting experiment for the segregation of beggars and tramps and the criminally inclined of this kind who show evidence of mental weakness. In one of the Danish islands there have been erected some small buildings to accommodate about forty people. Outside one enclosed space, the inhabitants are permitted to wander throughout the island at will. This, naturally, affords the wanderers a kind of limited freedom. The work of the colony is done by the colonists and the food and necessities are the result of their endeavors. It will be interesting to watch the further development of this colony.

Heindl reports on the result of his visit to the French colonization scheme for criminals in New Caledonia. What he says about this island is not at all favorable for a scheme which looks for the deportation of criminals. According to his observations, such a colony becomes a veritable hell; all criminal actions seem to increase there—theft, and even murder, are daily occurrences. The experiences which have been made in work either in the open, in the forests, or the mines, have been most dismal. An unfavorable moral contagion of a society of prisoners seems to work with renewed intensity in a prison colony. He seems to think that the life of the prisoner in camp is much worse than in prison. The stronger among the prisoners exercise a tyrannical discipline over

those who are physically weaker. There are frequently found struggles between various charges. Sexual crimes are extremely common. In addition to sexual crimes, gambling is very much in evidence, and the resort to violence to settle gambling disputes is by no means uncommon. A true regeneration of a criminal is a rare occurrence in New Caledonia. Of the 20,000 that have been sent there, there remain only 204 who show any evidence at all of being capable colonists. The cost is very great, and the conclusion is that deportation is a ruin to the country.

Egenberger takes up the question of broadening our attitude towards the problem of the weak-minded. He says that our efforts are directed chiefly to the education of the mentally deficient in order to afford them a means of becoming in a measure self-supporting and to lead them towards the proper kind of calling. For this purpose schools are not sufficient, particularly in cases of positive mental deficiency; there remains nothing but their concentration in institutions. Their education is best accomplished in a colony, where instructions and various methods of work are undertaken. After the period of instructions is ended, the deficient are much better off and lead happier lives in colonies which are established in the neighborhood and under the same kind of supervision as those in which they learn their work. The establishment of such colonies seems to be the duty of states and large cities.

Maier believes that criminals and those who show abnormal mentality are often similar individuals. He seems to believe that circumstances alone establish the fact whether they are to become criminals or not. He believes further that judges and police officials of the highest grade should become familiar with the facts of psychiatry. When this is established punishment will become more a question of social hygiene than purely a deterrent measure. Maier includes in his article an outline for a course in psychiatry for officials of the police department. In this course demonstrations of normal criminals and abnormal criminals are to be carried out.

A number of authors have written on the subject of asexuation of criminals and certain of the insane. The work that has been done in some of the American states is noted by Barr, Juliusburger and others. The prevailing opinion of these authors seems to be that the procedure is a good one; that is, if it is done under proper and careful supervision. Daniel, on the other hand, believes that prevention by means of segregation offers more chance for final results than sterilization.

Pfeiffer has an interesting article on suicide. From a study of a large statistical material, he comes to the conclusion that 75 per cent. of suicides are among people who are sick, and among the others would be found very few without definite pathological changes. Among 141 female suicides, only 12 were found without definite pathological findings, and of these 141, 23 were pregnant.

Wassermeyer has examined 169 cases of attempted suicide. There were 90 males and 79 females. This material was examined in the Kiel Psychiatric Clinic. 70 per cent. of the men could not be considered mentally affected; of the women, 72 per cent. were subject to mental disease. Among the men, the rôle of alcohol played the principal part; in two-thirds of the cases this was found to be the causative factor. Among the women who were not subjects of mental disease, the majority were hysterical. The most common cause given was temporary depression.

DIAGNOSTIC AND THERAPEUTIC NOTES.

CONTRAINDICATIONS TO NARCOSIS.—Stange (*Berl. klin. Wochenschr.*, No. 14, 1914). Patients with mitral lesions, in general, bear narcosis well; those with lesions of the aortic valves or of the aorta, poorly, especially if the heart muscle itself is weakened or diseased. In determining the advisability of giving a general anesthetic, a functional test of the sufficiency of the cardiac muscle would be most valuable. Practically, however, this is not an easy matter. If the patient is able to climb three flights of stairs without undue dyspnea, the heart muscle may be considered normally strong. Less than this, however, usually suffices to render a general anesthetic permissible. The blood-pressure is not a useful indicator, since patients with a pressure of less than 60 mm. or more than 200 mm. often bear the anesthetic well. The same is true of both large and small hearts, determined radioscopically.

The most useful test, according to the author, is a respiratory one. A normal individual can easily hold his breath for 30-40 seconds; one with an impaired myocardium only 10-20 seconds. The test is done as follows. The patient sits comfortably in a chair and makes a moderately deep inspiration. The physician lightly compresses his nostrils and directs him to hold his breath as long as possible. Anyone with a normal myocardium can comfortably hold his breath for 30 seconds and then breathes easily; if the myocardium is impaired, 20 seconds is his limit and is followed by dyspnea. Even patients with tuberculosis, bronchitis or pleuritic effusions can still hold their breath for 25-30 seconds. The writer concludes that no one, who is unable to hold his breath for 20 seconds, should be subjected to a general anesthetic.

NOVOCAIN AND POTASSIUM SULPHATE.—Gebb (*Muench. med. Wochenschr.*, No. 9, 1914). Hoffmann and Kochmann have shown that the anesthetic action of novocain can be greatly heightened by the addition of potassium sulphate, so that much smaller doses suffice for the same results.

Gebb has utilized such a formula for all sorts of operations about the eye, even for enucleation. The solution may be put up as follows:—

R Novocain.....	0.5
Solut. potass. sulphat. (2%).....	20.0
Solut. sodii chloridi (0.09%) ad.....	100.0
Sol. suprarenin. (0.1%) gtt. XX.	

This makes only a 0.1 per cent. solution of novocain, which will nevertheless produce complete local anesthesia in from ten to fifteen minutes after injection.

A NEW TEST FOR BEGINNING PERITONITIS IN CHILDREN.—Drachter (*Muench. med. Wochenschr.*, No. 11, 1914). Palpation of the abdomen often gives confusing results in children, as they may complain of pain in the absence of peritonitis and the reverse. The writer has found the following test useful. The patient lies on his back with the legs extended. The right leg is raised by grasping the foot with the left hand. With the right fist, the sole of the foot is struck a light but somewhat pushing blow. A minimal impulse is transmitted to the parietal peritoneum, causing it to rub against the visceral peritoneum. In the presence of appendicitis, the little patient usually complains of pain in the abdomen, a region to which his attention has not been directed. In an otherwise suspicious case, a positive outcome of the test confirms the diagnosis of peritonitis; a negative outcome, however, does not necessarily speak against its presence.

TREATMENT OF EPILEPSY.—Momburg (*Deutsch. med. Wochenschr.*, No. 15, 1914). Manual compression of both carotids has often a striking effect upon the epileptic seizure. The convulsions cease, the patient takes a deep breath, opens his eyes and is able, almost at once, to answer questions. The compression should, however, be maintained for some time. It appears that the resulting cerebral anemia diminishes the over-excitability of the cortex.

A number of observations of this kind induced Momburg to try the effect of a permanent operative narrowing of the carotids in epilepsy. The lumen was narrowed up to a point where the pulse in the temporal arteries was only just palpable. The operation was well borne, in the two cases that were subjected to it, and resulted, in the writer's opinion, in distinct benefit to the patients, the attacks becoming much less frequent and severe. For some time after the operation, the patients complained of always feeling tired.

RETAINED PLACENTA.—Gabaston (*Muench. med. Wochenschr.*, No. 12, 1914). At the gynecologic clinic at Buenos Ayres, the following method has been found useful for delivering the retained placenta. By means of a cannula, sterile physiologic salt solution is injected into the placental portion of the cut umbilical vein. The placenta gradually fills up, going as it were into a state of erection. Some of the fluid oozes through the chorionic villi and adds to the bulk of the retro-placental hematoma. The result is both a loosening of the placental attachments and a stimulation of the uterine musculature. The advantage of this method over manual procedures, especially as regards sterility, is obvious.

A NEW TREATMENT OF TUBERCULOSIS.—Spiess and Feld (*Deutsch. med. Wochenschr.*, No. 10, 1914). The writers have combined cyanide of gold with a specially prepared cantharidin. Injected subcutaneously, the compound, so they report, is of striking benefit in tuberculosis, being almost a specific for tuberculosis laryngitis. The preparation is not to be placed upon the market until it has been further tested.

TREATMENT OF DELIRIUM TREMENS.—Scharnke (*Muench. med. Wochenschr.*, No. 13, 1914). At the Strasburg hospital it has been found quite unnecessary to give alcohol to patients suffering from frank or impending delirium tremens. At the most, a little sherry may be added to the food if the patients refuse nourishment. The sovereign remedy is digitalis, which should be given promptly and in rather large doses. The writer uses digalen, and gives 10-20 drops, three times daily, by mouth. A prompt improvement usually follows. Before this treatment was used in the hospital, 8 out of 69 cases of alcoholic delirium died; since then, 23 patients have been treated without a death.

TEST FOR EMPYEMA OF THE FRONTAL SINUS.—Sarbo (*Med. Klin.*, No. 13, 1914). The patient is taken into a darkened room and a small electric torch held under the supraorbital margin, with its light directed upward. If the frontal sinus is normal, the frontal region just above the orbit is seen to be translucent; if there is empyema of the frontal sinus, no such translucency can be elicited. This is a convenient test for the general practitioner and will often clear up the nature of an obscure frontal headache.

A NEW METHOD OF PERCUSSION.—Sokolow (*Med. Klin.*, No. 11, 1914). A microphone is held before the open mouth of the patient and is connected by means of rubber tubes with the ears of the physician. The latter then percusses gently the various portions of the thorax and can make out accurately the slightest changes in resonance.

CORRESPONDENCE

LONDON LETTER.

By F. G. CROOKSHANK, M. D. Lond., M. R. C. P.

The event for the last week for medical men has been the visit paid to us in London, by Prof. Gustav Killian, of Berlin. On Wednesday last, the 27th, our distinguished visitor gave a demonstration of suspension laryngoscopy before the Laryngological Section of the Royal Society of Medicine; on Thursday he delivered the Semon Lecture of the University of London, before a large and enthusiastic audience; and on the evening of the same day he was entertained at the annual banquet of the combined Sections of Laryngology and Otology, under the chairmanship of Dr. Paterson, of Cardiff.

But it is with the Semon lecture that I propose to deal, in this letter. The meeting was held at the house of the Royal Society of Medicine, and the chairman was, of course, Sir Felix Semon himself, as vivacious, alert, enthusiastic and energetic as ever. Prof. Killian, a dignified and resolute figure, delivered his address in excellent English, and appeared to appreciate warmly the cordiality of his reception.

At the outset he gave us an historical résumé, taking off, as a sportsman might say, from April 23rd, 1895, when Kirstein, of Berlin, saw the interior of the larynx without a mirror for the first time. In a very short time from then the method of direct laryngoscopy was developed, with all that that development entailed, enlarging our powers of diagnosis, and adding enormously to our remedial capacities.

An immense field of scientific and practical activity, as Killian says, was opened up; but, as he did not say, no one contributed in greater degree to this amplification of Kirstein's work than he did himself.

Could anything more be wanted? If so, what? These were the questions that Killian asked himself; forgetting, however, as he says, the occasions when, during operation, better access to the larynx than through a narrow tube is much to be desired. What followed is best given in the speaker's own words: "This wish was to be fulfilled. In order to obtain, for a larger treatise, exact pictures of the deeper air-passages, I got my artist, in the winter 1909-10, to work from the cadaver, as time is usually too short to sketch and paint from examination in the living. We made use of the dissecting-room of the Freiburg Anatomical Institute for the purpose. With the head of the subject hanging over the table and the mouth wide open, a spatula was introduced over the tongue and

larynx, and the field of view illuminated by an electric hand-lamp. It was too fatiguing to hold the instrument until the artist finished, so I fastened it to an iron stand, which was screwed on to the dissecting table. An altogether new situation, viz., the head of the cadaver suspended on the tongue spatula, was produced. By suitable manipulation, and the mouth as wide as possible, a wonderfully clear view of the whole topography of the bucco-pharyngeal cavity, of the larynx, and of the entrance of the esophagus was obtained, and I would strongly urge trying this experiment in the cadaver. Many points will be learned which have hitherto escaped notice. The posterior pharyngeal wall appears in its whole length and breadth, from the uvula to the mouth of the gullet. Laterally the greater cornua of the hyoid stand out. The posterior surface of the laryngeal cavity is observed in its full extent, as well as part of the posterior tracheal wall. Only the anterior wall of the larynx remains concealed.

"This observation impressed me so much that it became an incentive to take up anew the improvement of direct laryngoscopy. The possibility of carrying out the same in the living came into my mind, for thus not only the upper, but also the deeper parts, of the pharynx, and especially the interior of the larynx, would be accessible to eye and hand in a manner unsuspected. The situation suggested a comparison with the work of the gynecologist, who is able, with the speculum in position, to use both hands in operating on deep parts."

Since successful examination of the living by this method appeared to depend on obtaining the same relaxation of parts as in the cadaver, it was at first proposed only to make the attempt in patients whose condition justified the administration of a general anesthetic. But, later on, it was found that the procedure was easily carried out, without pain, on cocaineized persons used to the direct method of endolaryngoscopy. "Suspension laryngoscopy was now frequently performed and the instruments were so altered as to be suited for general use."

But perfection had not yet been gained. Once more, let Prof. Killian tell his own story: "As material in respect to patients was limited in Freiburg, it was fortunate at this juncture that I was transferred to the larger medical centre of Berlin. In the two and half years in which I have been there, my assistants and I have been much occupied with suspension laryngoscopy and we have succeeded in improving it. I would especially mention the help given by my pupil Albrecht. Our greatest difficulty arose from the fact that the spatula, however carefully introduced, tended to alter its position and gradually slip out of the mouth. To prevent this and to obtain an exact view of the larynx, we were obliged to make the original instrument more complicated. The handle had to have in relation to the spatula an angle of adjustable size, and in addition the instrument, when well placed, had to be properly fixed. At first a mouth gag was employed, but it proved more practical to effect the opening of the mouth directly with the spatula hook. An obstacle for a long time was inability to see the anterior commissure. This could only be overcome by pressing on the cricoid externally with the finger. To do away with this, Albrecht made use of the counterpressor invented by my former assistant, Bruen-

ings. This answered the purpose so well that it has now been suitably attached.

"Experience showed that only a proportion of adults would tolerate suspension laryngoscopy under cocaine alone or with the additional help of morphine. In children it was altogether out of the question, an anesthetic had to be given.

"In the clinic at Freiburg, there has long been a certain partiality for scopolamine injections. Morphine and scopolamine are injected subcutaneously before operation to render the patient insensitive, and to a certain extent they replace ether and chloroform. The good effect of scopolamine encouraged its employment in suspension laryngoscopy. If administered in suitable doses one can dispense with chloroform and ether in adults (children should never be given scopolamine).

"These are the general principles which guided the development of the method."

To this graphic account let me add the author's own version of what the new method shows us: "The new method shows the larynx in general very much as we are accustomed to see it in the direct method. An essential difference is that a complete view is obtained over the whole larynx, pharynx, and mouth cavity. The immediate neighborhood of the larynx projects more plainly, the pyriform sinuses gape, whilst the arytenoid region and even at times the beginning of the cricoid plate come forward from the vertebral column. The laryngeal interior appears extended slightly in length in a sagittal direction. The cords are somewhat less freely movable. On deep inspiration a part of the anterior tracheal wall may be seen whilst the epiglottis is covered by its spatula. By lessening the inclination of the head a further extent of the trachea may be seen.

"The whole topography of the pharynx and larynx can be taken in simultaneously at a glance, and is so easily intelligible that even a layman can make it out. There is no difficulty in the access of instruments to particular parts. Although the intralaryngeal manipulations naturally demand a certain amount of practice, this is not in the least to be compared with that required for indirect laryngeal work."

Of the details of the method, I will say nothing. We saw Killian's latest instruments and tables; we admired his skill and we marvelled at the simplicity of the idea and the detail of its execution. At the lecture, the many points of technique involved were dealt with at length, and to the satisfaction of the experts.

But what of the practical application? I shall make no further apology, but cite at some length the expressions which Killian feels justified in using.

"Notwithstanding the short time since its introduction, the new method has been used frequently with the best results, not only by myself and my pupils but also by a large number of laryngologists in various countries.

"From the point of view of diagnosis it is of value, especially in childhood, and, indeed, in all cases where the simple, direct method is made use of. The single contraindication here is marked dyspnea.

"A whole series of affections of the larynx in children come up for diagnosis, especially where the cause of changes in the voice and breathing has to be determined. There may be revealed a simple

acute or chronic catarrh, a subglottic swelling or false membrane, a croupous or diphtheritic affection, or node formations on the cords, papillomata, tubercle, syphilis, perichondritis, or a foreign body. It is of value in congenital defects of the larynx and in cases of difficult decanulement.

"It is able to give information on the condition of the hypopharynx. If the tongue and epiglottis are held up with the spatula, the tube may be introduced easily and carefully, and this may be repeated without much harm. Before such manipulation the larynx should be slightly cocainized, even where the child is under a general anesthetic. If this is not done, passing the tube is apt to induce a slight stoppage of breathing from vagus irritation, which may be overcome by artificial respiration.

"Of late we have had many opportunities of removing by suspension laryngoscopy recurrent papillomata in small children. Albrecht has written fully on this subject and has reported a number of cases. From the fact that papillomata often recur even after thorough removal, it frequently happened that the same child had to be repeatedly subjected to suspension laryngoscopy. Although many children had considerable dyspnea when placed on the table, nothing untoward ever occurred.

"The larynx of the child is so accessible in suspension laryngoscopy that the papillomatous masses are readily seen. They can be removed entirely in one sitting and tracheotomy thus avoided, in certain circumstances. For the removal we use a narrow double curette rounded anteriorly, which can be supplemented by the sharp spoon. The larynx is then brushed lightly with a 1 per cent. salicylic acid in spirit. To prevent recurrence we have found the administration of iodide of potash and arsenic of good service.

"In small children who cry a great deal, small nodes not infrequently develop on the vocal cords and lead to persistent hoarseness. They are usually associated with slight chronic catarrh. They are mostly found in children who, in consequence of hypertrophy of the pharyngeal tonsil, thickening of the inferior turbinate, as well as septum deviation, etc., suffer from deficient nasal breathing. The direct method under a general anesthetic is used for diagnosis. Suspension laryngoscopy is here well adapted, as Seiffert and Katzenstein have pointed out, the nodes being easily removed in it.

"Though tubercle in the larynx in children is very rare, we have observed it and in suspension laryngoscopy curetted it. No case of syphilis has been recorded.

"With regard to difficult decanulement the condition of the subglottic space and of the trachea has to be examined and granulations removed if necessary. For this purpose it may be necessary to pass a tube through the glottis. This I have done, and Seiffert has reported a similar case.

"Suspension Laryngoscopy in Adults. Tuberculosis of the Larynx.—The treatment of laryngeal tuberculosis has at all times given the laryngologist much anxiety and trouble. It was rarely possible to do much because a more vital organ than the larynx, viz., the lung, was generally affected. It was only when we learned to improve the condition of the lung by residence in a sanatorium that better results were obtained in the larynx. Whilst treatment formerly was more or less symptomatic, it later on assumed a more active form. An attempt was made to remove the affected parts in the

larynx by operation, or to produce a cure by measures which destroyed the diseased tissue. On account of the great irritability of the phthisical patient this treatment was very troublesome, took up time, and caused the patient much discomfort and suffering. As only very little could be done in one sitting with the single or double curette, it was always desirable to shorten the local treatment as much as possible. I have often felt it would be a great boon to the patient if the major part were done at one time. After-treatment would materially be shortened and sanatorium treatment might be sooner begun.

"Since the introduction of direct laryngoscopy, operative treatment of the larynx has made marked progress. Curettage, as well as the deep puncture by the galvanocautery recommended by Grunwald, could be carried out with the greatest precision through the tube spatula. Something was lacking, however, which has now been supplied by suspension laryngoscopy. It has laid bare to the operator the whole laryngeal region. He could now work with both hands, using the curette and the mop at the same time. Patients were found to tolerate quite well in one sitting an extensive curettage and even deep puncture of an infiltration.

"Lupus of the larynx, especially its extensive form, is amenable to treatment in suspension laryngoscopy, and recently Simoleki operated on a scleroma in this way.

"Although simple neoplasms are very easily removed under the mirror, suspension laryngoscopy will often prove of value in cases of difficulty. It is especially adapted for extensive growths. Much more can be attempted and carried out with greater precision. At times it will obviate the necessity of an external operation.

"Removal of a polypus from the vocal cord is extremely simple and even the unpractised may perform it in suspension. Holscher, Steiner, Chiari, and others report cases.

"Suspension laryngoscopy ought to render important service in laryngeal cancer. In cases of difficulty, removal of a part for examination will be facilitated. Very small growths and suspicious places have hitherto been removed under the mirror or through the tube spatula. Areas on the cords, on the epiglottis or on the aryepiglottic folds can be treated in this way. Suspension laryngoscopy enlarges this field of usefulness, but the limits of intralaryngeal removal should be very definite. E. Meyer reports excision of a carcinoma from the epiglottis. Such cases, it is needless to say, ought to be selected with care."

So moderate and careful a statement will compel the attention and study of even the most conservative, and the least eager to run like the Athenians of old after 'some new thing.' Suspension laryngoscopy has 'come to stay'; of that there can be no doubt. And, as Killian said in conclusion, we have it in a method which renders definite service under definite conditions and that enlarges still further the limits of our diagnostic and therapeutic knowledge.

That the illustrious inventor will live long to see the full acceptance and perfection of the discovery with which he has enriched us, is, I am sure, the desire of every one of his auditors and admirers.

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EDITORIAL.

THE FASHIONABLE DOCTOR.

In the past so much has been written about the scientific doctor—the man who dedicates his life to the science of medicine—that the fashionable doctor has been quite overlooked. Now this is a mistake, for the fashionable doctor is worthy of study, and moreover is a social entity whose doings are of enough moment to enlist the attention and journalistic sympathies even of those writers for the medical press, whose levity is not their outstanding quality. On the surface, the fashionable doctor may appear frivolous and worldly, but deeper down he is a serious philosopher, an exceedingly clever man, a psychologist of a high order, and so close a student of mankind that one must admire his acumen, his penetration, his perspicacity. In case he is asked for an opinion that he feels might get into the daily papers, he gives it quite reluctantly, in fact, with a diffidence that has the charm which one attaches to the halting mental processes of boyhood. He really does not want his rather superficial remarks to be published; he would rather they were not; but as long as the interviewer insists on an opinion, he feels as if he ought to give it, for if he does not some doctor of a lower order of intelligence will disgrace the medical profession by utterances that have not the stamp of deep thought. If he really had his way, he adds, he would put a stop to all interviews; they are of no value to the public; and they interfere decidedly with one's practice. The interviewer notes the emphasis placed on the word 'practice,' jumps to the conclusion that he is dealing with a man who is indeed too busy to talk, hence his hesitancy and deprecatory manner, and is thoroughly charmed. In fact, he is fascinated to so great an extent that his judgment is warped, for when he sits him down to write his interview with the fashionable doctor in regard to the ill effects from headache powders, the increasing

use of cocaine in the 'best' circles, the immorality of dancing the modern dances or any other important 'medical' subject, he does not fail to mention his surprise that a large practice among the 'best' people should be accompanied by an enviable degree of modesty. And the fashionable doctor frowns when he reads this compliment, in case he is in the presence of friends; but in the quiet of his study, does not the frown give way to a quiet chuckle?

At this season of the year the fashionable doctor browses in one of the richest pastures known to man. When the temperature proclaims summer heat, when people are restless and dissatisfied, when poverty pants for a breath of fresh air in cramped and suffocating quarters in tenements, when the rich are fearful lest the eating of too much meat and the drinking of complicated beverages will upset their stomachs, he is to the fore with warnings, with kindly advice, in fact, with all those embroideries of conversation which are his specialty by right of a mind that knows the weaknesses of mankind. Of course, it is midsummer madness, this talk of his when judged from a scientific standpoint, but we must not forget the season and how clever he is to utilize its monotonous moments for his own gain. A medical man of scientific parts is unfit for work in summer, he wastes his time away from the city in pursuit of pleasure and in repose on lakes or in the hills, he knows that he must recuperate from his winter's work or be unfit to take up his tasks again. But the mental make-up of the fashionable doctor demands no such repose, for it has a natural repose—the sort that comes from being a philosopher of small things. Hot weather does not upset him, the sufferings of man are to be expected, we are indiscreet in the matter of eating and drinking because we are human,—“And look at me,” he exclaims, or rather says in his suavest tones (the fashionable doctor never exclaims), “I am just as content in summer, no matter what the temperature, as I am in winter. In fact, to me patients are more interesting in summer than in winter. Their ailments multiply, and you would be surprised how often I am called to a patient to find that his trouble is imaginary or one that with advice is soon remedied. Really, summer is the time when people most need the kindly offices of a medical adviser.” And while this beneficent work is going on, while a whole city is being saved by advice, the scientific doctor is wasting his time on lakes and in hills, trying to get back his strength for the coming winter; and, though he may succeed, he is not by any means doing his duty towards the public. In fact, he is selfish in so far as he is continually thinking of his own comfort and absolutely refusing to undergo personal sacrifices. In this respect he cannot be compared with the fashionable doctor who lives in the sweltering city from day to day, and when urged to leave for any length of time pleads content and

happiness and a modest estimate of his duties to his fellowmen. Of course, he grows wan and thin and may perhaps show decided signs of the wear and tear of a summer in town; but is not the aureola around his head an asset, and will not his wealthy patients applaud him on their return to town for his dedication to the exigencies of his practice? The scientific doctor—that quintessence of selfishness—will not fare so well; he will slip back into his customary place with never a nice remark from anyone; and if he is fortunate he may be spared the pitiless criticism which declares that he could well afford to stay away since his practice is not any too large. So all hail to the fashionable doctor!

But it does not always happen that the fashionable doctor stays at home. Occasionally his psychology tells him—and his psychology, as we have already remarked, is a dependable factor in his make-up—that it were best for the continuance of his success as a practitioner to make a tour of Europe,—to visit the clinics, to bring back a number of shiny instruments and new-fangled apparatus wherewith to decorate his personality and also his office. Before he engages in this fearfully adventurous trip, and although he has made all preparations to travel, he engages his medical friends in intimate converse to find out just what they think of his leaving for, say, a space of six months. Of course, no two agree on the advisability of the trip, conversation of considerable length is made, rumors of his prospective withdrawal from the scene of his great activity reach the general public, surmises are instituted; one says he has been overworked, another that his nerves are a-jangle, and another still has heard that a well-known neurologist has insisted that if he does not take a complete rest for six months his mind will give way. And thus what the fashionable doctor had in mind all along has come to life—the germ of publicity is now a many-leaved bay-tree. But the European tour is not without alloy, for if the fashionable doctor knows his special *métier* as well as he should—and who can doubt that he will ever overlook a chance to get into the limelight—there will soon appear in the local papers a bit of thrilling news to the effect that on account of his absence several ‘society’ ladies have been compelled to consult specialists elsewhere. No doubt this is true, no doubt these ‘society’ ladies long for something just as fashionable and just as kindly as their absent adviser, and not being willing to undergo the trouble of seeking a duplicate of this pearl of great price in their own community, find it more convenient to go elsewhere for advice. But how did the paragraph get into the papers? Surely it did not come from the fashionable doctor; he was too far off to be in touch with the papers. The scientific doctor thinks otherwise, and wrongly, we say, for is it within the bounds of reason to imagine that the fashionable doctor would have the time, now that he is wallowing in shiny instruments and new-

fangled apparatus, to advise his 'society' patients to insert this sort of news to advertise both himself and themselves? But the scrap of news is there for him who runs to read, and though we may not be so critical as the unadvertised scientific doctor, we must perforce admit that the ways of journalism are passing strange.

Is it not strange that every time a fashionable doctor does anything in connection with his practice it is at some personal inconvenience, some sacrifice that proclaims him a martyr? If he stays at home, though he may reiterate his content and peace of mind, some kind-hearted patient will circulate the report that he is really undermining his constitution through overwork, and when he leaves town, lo, the papers announce that his absence is costing him many dollars. That he is a fraud it would be hard to prove, for he has so many of the qualities which go to make up a gentleman that to say he is really imposing on our good nature would be stating an exaggeration. He really does not seek self-advertisement, no matter what may be the adverse opinion of his scientific confrère whose close application to work makes him metamorphose sheer cleverness into something quite despicable. And cleverness is the hallmark of the fashionable doctor, the sort of cleverness that is never offensive but has such an understanding of our very human foibles that it always stands him in good stead. When he is called upon to make a statement for the press, he never offends as would a less clever man, and each and every word is so nicely balanced that neither the rich nor the poor, the strictly moral nor those a little lax in their morals, the prominent physicians nor those who belong to the large army of nonentities, can ever feel affronted. He is always the fashionable doctor of standing and breeding. He may have started out in life as a butcher's boy or as something lower in the social scale, but in after years his lowly beginnings are swamped in the sea of forgetfulness, and only the college or university, to which he went, is remembered. Breeding with him is easily acquired; it is self-restraint; and when this is practised daily it is soon a very good counterfeit of breeding and will pass muster even among critics who pride themselves on their acumen. The scientific man rarely has self-restraint; he is either quite arrogant as regards what he knows, and being arrogant he may talk too much; or he is so modest that his behavior passes for that of a very stupid man. But clever he is not, nor does he worry himself as to what others may think of him; and the result is that he is thought to be a boor or hopelessly uninteresting to those among the laity who crave a smattering of medical knowledge. So again we say all hail to the fashionable doctor!

But it is in the sick-room that the fashionable doctor shines with a radiance that is unmistakably brilliant. There his gentle qual-

ities, his kindly advice, his self-restraint reach a high point of perfection. He does nothing to ruffle the nerves of his patient; if she—and it is generally a ‘she’ who sends for the fashionable doctor—is deeply religious he feigns a religious spirit and at once is *en rapport* with his patient; if she is rich and delights in talking of her riches because they have been recently acquired, the mobility of his mind will at once cause him to swerve to her point of view, no matter what his innermost thoughts may be, no matter if his fixed idea is an undying hatred of the *nouveaux riches*; if she is only fairly well off and respectable and talks a deal of her respectability because it has always been cultivated by her family instead of the acquisition of wealth, he will sing the praises of respectability in tones of great refinement and sweetness. In short, he will prove to be a comfortable person to have around, a mental healer is his best estate; and though science, were she present, might laugh at his inoffensive manner and the readiness with which he falls in with his patient’s opinions, she would have to admit that here is one who understands human nature. How different indeed are the actions of the scientific doctor in the sick-room! While not exactly like the historic bull in the china shop, he is not as gentle as he ought to be. He may have all the instincts of a gentleman, but outwardly he is rugged; and, even if there is nothing bearish in his manner, suavity and sweetness and self-effacement are not his outstanding qualities. Science is a most exacting taskmistress; when she finds the material that appeals to her she moulds it according to her own ideas and not to the world’s; her independence cannot be questioned nor can her authority, and no Czar of all the Russias was ever so autocratic as she. That she is intolerant of all those charms that make the fashionable doctor so huge a success might be overstating matters, but she is none too kindly disposed to a wobbly point of view in regard to disease, that takes small note of directness, of hard and indisputable facts, of a courageous envisaging of what is apparent and what may be hidden. And just because her votaries must be stern and honest and unswerving in their judgment, they must necessarily lack the graciousness of the fashionable doctor. And again we have the spectacle of the fashionable doctor frowning in public, this time when scientific men are present, and afterwards chuckling in the quiet of his study. Do you see the point?

In no country is the fashionable doctor without honor. His following is large, his success as a curative agent of the ills of man is on everybody’s lips and rightly so, for he is deserving of praise. Any man who can achieve his ends by merely flirting with science is a genius, perhaps not of the highest order but surely not of the lowest. And any man, who can stretch his genius until its tenuity

is at breaking point and yet keep it intact so that no one is the wiser that a mere puff of air could dissipate it forever, is without a doubt an adept in the art of cleverness. It is well in its way to say that this sort of thing cannot last, that before many days come and go the perspicacious public will be aware how they have been cheated, and that the brains of a community cannot be of so low an order that they spell only dullness. Now, my interested friend, you who have just received your sheepskin and are in doubt whether to be a fashionable doctor or a scientific doctor, do not imagine for a moment that the patients of the fashionable doctor are being cheated; they are getting their money's worth, I can assure you; their ills when they were imaginary—and very often they are imaginary—could not have been combated so well by anyone else, for all they needed was advice and perhaps an aperient; and they did get well, you must admit. And even when their ailments were not imaginary, were they not receiving close attention, were they not being helped over the rough places incident to disease by a soft and gentle hand, and could they say in all truth that they were neglected? You, as a beginner in the practice of medicine, are perhaps foolishly enthusiastic in the matter of correct diagnoses; you are carried away by your youthful enthusiasms; you feel that if one is not cocksure as to the exact nature of a disease one ought to quit and yield the place to another of greater penetration. These thoughts are commendable and show that you are still in the thrall of science; they show that your youthful mind has a soil that can grow only honest and healthy and clean thoughts. But do not set too high a value on your honesty and straightforward speech; remember there is a world to contend with that has been a bit spoiled by fashionable books, fashionable pictures and fashionable doctors. It is a world that demands suavity and chicanery and unctiousness, and is highly critical of the scientific spirit when clothed in common clay. Your sheepskin is on the wall; your chair is in place before your open desk; you cast admiring glances around your office and you place a high value on your instruments. The door opens; your first patient enters; you know the critical moment has arrived. Which is to be your vocation for the rest of your life—that of a scientific doctor or that of a fashionable doctor? Who can tell?

P. S.

A MODERN TRAGEDY.

Scarcely a week passes that some journal, be it medical or otherwise, does not publish an article that is heralded forth to save mankind from the terror of all modern terrors—fat. It would seem that be the season summer or winter, spring or autumn, our one thought is how to reduce our weight. Of course, there no

doubt will be some interested reader who will say that the accumulation of fat as the years passed did not worry him at all, and that he has reached middle age not only in a comfortable physical state but also in a mental condition that is the envy of his neighbors. And no doubt he will add that when he was thin he was much less ambitious, that he read less, that he gave small thought to his mental graces, that he fell in love with the wrong woman and was extremely unhappy, that his digestion was always a matter of worry to him, and that his nerves were not what they should have been. And he may also add that his circle of friends widened directly he got fat, that no longer did men look askance at him as at one who cannot be trusted; and in case he is a physician of great prosperity, he may asseverate with heat that his lean days meant a lean income and his fat days so fat an income that not one of his patients objected to paying him cash. All this he may say and think that he is interpreting his feelings, his emotions, his very life in terms so truthful that no one can question them. But let us tell him at once that he is wilfully deceiving himself, and what is worse deceiving others when he should be a warning to all those who are beginning to feel genial and content under the influence of the first five additional pounds, for is he not in a position to tell them that he has been really playing a double game and that his geniality has been assumed to hide his melancholy thoughts? At least that is what Mr. Vance Thompson, who has written the preface to the book "Eat And Grow Thin—The Mahdah Menu" (E. P. Dutton and Company, New York), thinks should be done to save a world that is fast sinking into a state of suet and tallow.

If it were not that medical journals are at present advancing all sorts of theories in regard to how one should reduce one's weight and the absolute necessity of it, and taking all fat people to task as if they were a menace to our civilization, the writer of these lines would dismiss Mr. Thompson's remarks at once because of their ineptitude, their inanity and their exaggeration. But Mr. Thompson, although not a medical man, is not a whit different from the rank and file of medical writers on obesity and its disastrous consequences, since he illustrates that once an idea becomes fixed it grows until all other ideas are swamped. Medical writers on obesity may give some sound advice and often do, and Mr. Thompson writes nicely and sanely for a minute or two and then lapses into the usual tirade against the stupidities of man to allow himself to grow fat. If he had said that to grow fat is an evil that brings certain diseases—or are they discomforts?—in its train, we might hearken to his advice; but this he does not, for fear, we imagine, that the reader might not get the nightmare he desires after reading his weighty words, the sort of nightmare that

sees even in the addition of one ounce of fat a complete destruction of one's placid disposition, one's probity, and one's success as a social entity.

What is obesity? one may here ask of the medical writers and of so obsessed an individual as Mr. Thompson. Is it a gain of ten pounds or twenty, or does it mean that the person is so fat that he cannot walk with comfort. Medical dictionaries define the word as corpulence, fatness; simply by these two words, when they could emphasize the importance of the affliction by using a long list of qualifying adjectives to strike terror to our hearts. But simplicity is not to the liking of modern writers; it would put the machinery of life back to those far-off days before the many 'isms were introduced in our literature by the Norwegian and German writers; it would, in short, prevent the multiplicity of articles on all subjects. Could anyone in his right senses wish for the return of this sort of thing, especially in regard to the many-faceted interpretations of so momentous a change in our organisms as 'middle-age spread' and the innumerable cures which have been given to a world which, were it not for these gifts, might already be in a state of incurable melancholia?

Perhaps there will be some readers of these lines who will think that so unimportant a contribution to the scientific (?) treatment of obesity as is "Eat And Grow Thin" should be dismissed with a few words, but let us hasten to tell them at once that this book will no doubt have a wide circulation and that it would be well for them to buy it, or what is more convenient borrow it from a friend and fail to return it. In fortifying themselves with the many original and startling disclosures, they will be in a position to treat their future patients perhaps more successfully than in the past. For instance, having read that all embezzlers are fat, that no man can be a first class poet who wallows in suet, that women flee from fat men, especially when the latter pretend to be in love, that men of Mr. Chesterton's mental adornments cannot possibly be humorists, no matter how hard they try, because being fat the world will laugh at them instead of their laughing at the world, they will know exactly how to meet each and every patient in a kind and sympathetic manner. The embezzler will be told that, though detectives are on his trail, the way to outwit them is to eat raw oysters, roast turkey with cranberry sauce, string beans, salad romaine and fruit for dinner, minced turkey, fruit salad and stewed prunes for lunch, clam cocktails, fish, venison steak with aspic jelly, truffled, French beans and grapefruit salad for dinner, for this diet will at once reduce him some two pounds a week, thus causing a complete disguise; whereas if he is foolhardy enough to imitate "a Parisian banker, grown very corpulent, weighing awful hundreds of pounds" who fled to a provincial town after keeping

funds which did not belong to him and who "spent every day in a Turkish bath" until "the fat sluiced from him like melted butter from a colander. . . . and he looked like a man who had stolen a fat man's skin and was running away in it," he will be recognized by astute detectives as a man who had too violently reduced his weight. The poet will be told that his hexameters will improve if he rids himself of fat by a diet that is on lines similar to the embezzler's; the corpulent but unsuccessful wooer will be warned against food that is not à la Mahdah; and, what is most important of all, the humorist, who is trying to make a livelihood out of his writings and who is distraught because of his failure, will at once become popular if told to eat boiled corn beef, with new cabbage and onions, huckleberry gelatine and stewed celery!

It may be that what has just been stated will not appeal to those medical men who have had a wide experience in the treatment of obesity and who have been highly complimented by their patients. And it may be that some of our readers will follow Mr. Thompson's advice and if they find it thoroughly unsatisfactory write us indignant letters on account of our enthusiastic advocacy. To prevent the latter contretemps it would be well for us to state here that our attitude in the matter of a cure for obesity is similar to Dr. Grummidge's to monomania, as set forth by Dickens in his "Full Report Of The First Meeting Of The Mudfog Association For The Advancement Of Everything." If the reader will substitute the word 'obesity' for 'monomania' and 'thinness' or 'leanness' for 'pearls,' he may grasp our meaning. To quote: "Dr. Grummidge stated to the section a most interesting case of monomania, and described the course of treatment he had pursued with perfect success. The patient was a married lady in the middle rank of life, who, having seen another lady at an evening party in a full suit of pearls, was suddenly seized with a desire to possess a similar equipment, although her husband's finances were by no means equal to the necessary outlay. Finding her wish ungratified, she fell sick, and the symptoms soon became so alarming, that he, Dr. Grummidge, was called in. At this period the prominent tokens of the disorder were sullenness, a total indisposition to perform domestic duties, great peevishness, and extreme languor, except when pearls were mentioned, at which times the pulse quickened, the eyes grew brighter, the pupils dilated, and the patient, after various incoherent exclamations, burst into a passion of tears and exclaimed that nobody cared for her, and that she wished herself dead. Finding that the patient's appetite was affected in the presence of company, he began by ordering a total abstinence from all stimulants, and forbidding any sustenance but weak gruel; he then took twenty ounces of blood, applied a blister under each ear, one upon the chest, and another on the back; having done

which, and administered five grains of calomel, he left the patient to her repose. The next day she was somewhat low, but decidedly better; and all appearances of irritation were removed. The next day she improved still further, and on the next again. On the fourth there was some appearance of a return of the old symptoms which no sooner developed themselves than he administered another dose of calomel, and left strict orders, that unless a decidedly favorable change occurred within two hours, the patient's head should be immediately shaved to the very last curl. From that moment she began to mend, and in less than four-and-twenty hours was perfectly restored; she did not now betray the least emotion at the sight or mention of pearls or any other ornaments. She was cheerful and good humored, and a most beneficial change had been effected in her whole temperament and condition."

P. S.

ORIGINAL ARTICLES.

SACRO-ILIAC DISPLACEMENT.

By JAMES K. YOUNG, M. D., of Philadelphia,

Associate Professor Orthopedic Surgery, University of Pennsylvania; Professor Orthopedic Surgery in the Philadelphia Polyclinic, etc.

The many pathological processes that are constantly confused with cases of sacro-iliac displacement makes it incumbent upon the attending physician to be able clearly to differentiate this affection from various allied conditions which it may closely simulate.

ANATOMICAL DATA.

The sacro-iliac joint is both a true and a half joint, deriving its strength and tenacity from its anatomical position and its powerful ligamentous attachments. This joint is well fortified by a series of layers of strong ligamentous fibres, filling the interval between sacrum and ilium and also attached to the rough iliac area behind its articular surface, extending to the back of the lateral masses of the sacrum. A most important ligament is the posterior sacro-iliac; less so, yet quite important, is the oblique sacro-iliac, while to add, still further, stability to the articulation are the ilio- and sacro-lumbar ligaments. At times, before the approach of senility, this articulation is found to be ankylosed.

True to their name, or rather lack of name, the os innominata presents that peculiarity of contour that gives strength and stability to the bony skeleton. The superincumbent body weight and the counterpressure exerted by the femora account for the flaring contour of the ilia, and the normal sacral curve. From a mechanical standpoint, the interruptions in the pelvic outline at the pubic symphysis and at the sacro-iliac articulation contribute to the strength of pelvis and act as a bumper for minimizing shocks. The sacro-iliac articulation is of much interest in obstetric practice. It allows of these movements: Up-and-down, also a separation of the pubic bones with a corresponding movement in the sacro-iliac articulation of the same side. In symphysiotomy, the motion which allows of the separation occurs in the sacro-iliac articulation, the pubic bones move downward and outward, adding materially to the

pelvic space, while the sacrum riding upon a horizontal axis, by this very motion contributes to the increase of the width of the birth canal. Advantage is taken of this fact, in the employment of Walcher's position, that is, the supine position of the patient in extreme elevation at the edge of the bed or table, the thighs hanging in extreme extension.

Only recently, clinicians and scientists have fully agreed that the sacro-iliac articulation is a true joint, normally allowing of some motion, this being true, when the ligamentous attachments binding the various parts of the pelvis or of the pelvis and the contiguous bony structures have preserved its normal tone. Conversely, whatever tends to disturb this normal reciprocal relation or interfere with the related musculature, will of necessity disarrange these correlated movements and result in an increased movement of the articulation under review.

For convenience sake, though not absolutely correct, we refer to the sacrum, as the keystone of the pelvic arch, and thus suspended between the ilia (broader in the female than in the male), this bone is important not only for its muscular and ligamentous relations, but especially so for its inherent rocking motion upon a horizontal axis, situated in a plane, at or about a position, indicated by the middle of the sacro-iliac joint. The sacrum finds its greatest stability in the anterior and posterior sacro-iliac ligaments which secure it to the ilia, while its lower portion is maintained by the sacro-sciatic ligaments. For a moment we need revert to the musculature of the skeleton to understand the balance in the economy normally existing between the harmonious working of the lower extremity and the superimposed body weight. The spinal column is a flexible rod, divisible in three parts, each of these component parts describing a curve. Those portions of the spine, articulating with the ribs, allow of muscular attachments; and thus we find many layers of muscular tissues exerting powerful action from the occiput to the coccyx. In unison their concerted action extends the spine; while acting but upon one side, they produce a lateral bending.

The antagonists of these muscles are found extending from the pelvis to the lesser trochanter of the femur. These muscles which are destined to terminate in a common tendon are the iliac and psoas muscles, and the extreme action that they exert is easily understood, when we reflect that the broad expanse of the iliac muscle takes origin from the inner surface of the iliac crest, from the iliac fossa, and in a limited manner from the iliolumbar ligament. Thus, it becomes at once apparent that the iliopsoas muscle is a powerful flexor, bending the lower limb on the body or the body on the thigh.

This antagonism in action of the deep muscles of the back is essential to the correct equipoise of the body, and it finds expression

in the normal ligamentous attachments supporting the pelvic girdle; for if the integrity of the joint be interfered with or the normal muscular balance be disturbed, the harmonious relationship between the trunk and the parts below and dependent upon it must of necessity be broken.

ETIOLOGY.

Many cases of rebellious sciatica, lumbago, backache, and kindred affections find their etiology in some abnormality of the sacro-iliac articulation; again any impoverishment of the bodily health, making of necessity vicious inroads upon the system, may in this way impair the integrity of the joint under discussion. It is likewise true that trauma or the effects of muscular strain may also seriously involve the sacro-iliac articulation. The normal tonicity of the pelvic ligaments are prone to suffer in instances of passive congestion, menstruation and pregnancy.

Anatomically the sacral plexus and lumbo sacral cord are topographically related to this articulation and thus we may at times offer a correct diagnosis of nerve pains, or nerve imitations, referable to branches and terminal filaments of these nerves. Again, neurotic paroxysms may be engendered by a relaxed condition of the sacro-iliac ligaments, or the pain produced may be directly traceable to the pressure exerted by the pathological process, the results of inflammatory exudates.

PATHOLOGY.

The simplest abnormality of the sacro-iliac ligament is the strain, whose disappearance depends upon the correct reciprocal action being readjusted between the various groups of muscles. If the strain, however, continues, there results a sudden or gradual displacement or giving away of the ligamentous attachments, associated with pronounced instability of the joint, in proportion to the amount and nature of the bony displacement.

What is commonly designated as a 'stitch' in the side, finds its true explanation in a rupture of some of the fibres of the sacro-iliac ligaments, which permits of an abnormal degree of movement, with partial luxation of the articulation. In the more pronounced cases, we find complete dislocation, impossible of voluntary replacement.

Slight luxations, however, as just referred to above, are prone to affect the other joint structures in the pelvic girdle. Thus, those excruciating nerve pains, referred to the leg and thigh and wrongly designated as neuralgia or sciatica, with areas of anesthesia and hyperesthesia, often find their etiology in an abnormal sacro-iliac articulation, which pathological condition is reflected along the course and distribution of the sacral plexus and lumbosacral cord.

Prolonged illness may result in bilateral lesions of this articula-

tion, resulting in instability of the pelvic joints, an abnormal degree of movement at the sacrum and the development of flat-back.

Weakening of the joint, whether the causes be obstetric, gynecological, neurotic, or through other disturbing influences, extremely enfeeble the ligamentous structures, and invite the inroads of pathological processes, not the least conspicuous of which is tuberculous arthritis.

CLINICAL VARIETIES.

The two most important of the clinical varieties are the traumatic and the static. The *traumatic* may be caused by direct violence, or be the result of muscular action. The damage inflicted is not in direct ratio to the severity of the exciting cause. The causative factor may be slight, such as a mere misstep or a slight slip as from a moving car, for instance, and yet the damage inflicted upon the joint may be as severe as in the case of the laborer employing all his physical strength to lift a load, the entire force of his effort being thrown upon the joint in question. The traumatic type is usually unilateral, but may also be bilateral. Even the act of sitting down precipitately, a sudden fall or stumble may evoke the trouble and produce any condition of the joint from a mere strain to a laceration of the ligaments.

The bedridden sufferer, the patient confined to bed over a long period of time, and the patient coming from the operating table, where the lumbar spine has suffered an effacement from the long period consumed in the etherizing, may all develop an intractable form of backache, dependent on sacro-iliac strain. Traumatic sacro-iliac strain, may also result from a shortened limb, deformities of the hip, those conditions that almost entirely throw the body weight on this articulation, also in cases of extreme lordosis, in Pott's disease and in those diseases impairing the integrity of the lumbar and pelvic joints as evidenced in cases of spinal osteoarthritis.

The *static* variety is mechanical in character, although one is often at a loss to know if the intrapelvic process has caused the orthopedic condition or vice versa. The static variety is most largely composed of the uterine and the neurotic. The uterine variety of the static type finds expression in a score of intrapelvic conditions attending childbirth, menstruation, the presence of tumors and many gynecologic pathological entities. Relaxation of the ligaments of the pelvic girdle give rise to abnormalities in the sacro-iliac joints. In the severer types, actual displacement of the joint may occur, simulating in every way the symptomatology of the traumatic type, so that the patient dreads to walk or indeed move because of the necessary restricted spinal movements and from the excruciating pain experienced in the lower limbs.

In the neurotic type, the patients suffering are those of a highly nervous organization while the nerves and muscles are kept through unremitting excitement in a constant state of tension. They are afforded muscular relaxation only during sleep, and this intermittent relaxation, together with anesthetic and hyperesthetic areas so commonly found in the lumbar and sacral regions, is often found associated with impaired bodily health and obscure nerve pain, pains variously denominated as neuritis, backache, sciatica, which really have their origin in a sacro-iliac strain. In some of these patients, the muscles of the back may be in a state of spasm or the pelvis be tilted, giving the impression of a shortened limb. Unlike the traumatic variety, the spasmodic muscular contractions extend high up into the occiput, with lordosis and an anterior tilting of the spine, although the flat back, characteristic of the traumatic variety, may be found.

Another group of the static variety comprises those instances of strain, due to fixation or ankylosis of the neighboring joints, which usually act in a compensatory manner, as ankylosis of the lumbosacral articulation, the hip-joint, and the pelvic symphysis. The fixation of these articulations throws an undue strain on the sacro-iliac synchondrosis and gives rise to symptoms of strain or subsequent disease.

Likewise the locking of the sacro-iliac articulation, through enlargement of the transverse process of the last lumbar vertebra, or deformity of this vertebra or the first segment of the sacrum, may give rise to sacro-iliac strain. In examining 150 specimens of deformed pelves in the Wistar Museum of the University of Pennsylvania and the Woman's Medical College of Pennsylvania several anomalies of this character were discovered by me and reported elsewhere.

SYMPTOMATOLOGY.

These include:—

1. Pain.
2. Limitation of motion.
3. Abnormal mobility.
4. Changes in attitude.

Pain is characteristic. It is usually referred to the joint itself, to the sacrum, or to those areas of the lower limbs whose nerves branch from or are in intimate relation with branches from the sacral plexus or lumbosacral cord. The pains are of two kinds: Those due to joint strain and those due to direct pressure. In joint strain the pain is usually greater in one or the other leg, although both legs may be equally affected. Usually these pains are worse at night, because of the strain placed upon the pelvic joints; although much pain may be suffered during the day, as when the

patient uses physical effort at his vocation, or when much stair-climbing is demanded.

In the second variety, that is, direct joint pressure, pain is caused, as indicated by the name, by direct pressure on the nerves, due to a disarranged articulation, the sharp, roughened edge of the joints being thrown directly against the nerve trunk.

Limitation of Movement.—This may be observed in the motion of the body upon the thighs or vice versa. Downward displacement of the ilium limits the range of extension and affords a characteristic test, at the same time the limb appears longer with a shortening of the hamstring tendons. In the standing posture lateral bending is more limited than normally. Clinically, Kernig's sign is of undoubted value. The limbs are tested one at a time. The patient is placed in a supine position, and the normal limb is raised, with the knee fixed, and the degree of flexion of the hip-joint is noted. The affected knee is tested in the same way, when it will be observed that flexion at the hip-joint is much more restricted, due to contraction of the hamstring muscles and to the pain suffered along the course of the sciatic nerve.

Abnormal Mobility.—Relaxation from long-continued strain increases passive motion in these articulations. One of the best of all tests is to request the patient to stand with the knee fixed and ask him to raise and lower the heel from the ground, in rapid succession. By this test the writer examined a patient in the hospital of the University of Pennsylvania, and he was enabled to discover a sacro-iliac mobility of $\frac{3}{4}$ inch.

Changes in Attitude.—The patients assume a stooping posture or bend forward because of spasm of the hamstring muscles interfering with the forward movement of the thigh and thus impeding locomotion. In the erect position, the trunk is thrown in a direction opposite to the lesion, with a lowering of the shoulder on the affected side. In stooping the patient avoids bending the trunk, because of the pain incurred, but accomplishes the act by flexing the knees, as does the sufferer from spine disease, where the spine is held rigid.

TREATMENT.

The treatment includes:—

- (1) Reduction.
- (2) Employment of apparatus.
- (3) After treatment.

Reduction may occur spontaneously, but recurrences are usual. When reduction cannot be effected spontaneously, place the patient on his face, produce forced extension with traction on the limb, or place the patient between two chairs, a foot and a half apart, and make downward pressure over the site of the joint.

Forcible Correction.—In cases of marked displacement with severe deformity it is sometimes necessary to anesthetize and reduce the deformity by forcible means. The patient, having been prepared for operation and anesthetized, is placed in a prone position on the operating table. The trunk and pelvis are firmly fixed by two assistants, one of whom pulls upward, placing his hands under the patient's axillæ, the other fixes the pelvis. The operator abducts the lower extremity and makes strong traction downward. This is repeated a number of times. Patient is then placed between two tables, and a firm plaster cast is applied extending from the costal margin to two inches below the trochanters.

Employment of Apparatus.—The simplest form of appliance is a broad belt made of a surcingle and two buckles. This belt is not infrequently worn by laborers as a preventive measure against repetition of the displacement. The spider-like brace of Osgood has many endorsers. Made of a heart-shaped pad, it combines two uprights and four lateral steel bands, so adjusted that the corset thus formed exerts pressure on the sacrum.

The writer's apparatus is a combination of an abdominal support of special construction and a well-cushioned triangular pad, so made as to make the requisite pressure on the sacrum. Pressure on the upper or lower portion of the sacrum is regulated by means of two hard-tempered semicircular springs, to which webbing straps, firmly attached, are buckled in front. The pressure may be centered upon the upper part of the sacrum, by drawing the upper straps tight while the lower ones are allowed to remain moderately loose and vice versa; pressure may be made upon the lower region of the sacrum by drawing the lower straps tight. When required the apparatus may be retained in position by perineal straps, but when it is well-fitted they are unnecessary. The principle to be attained in all such devices is to effect pressure, either above or below, as needed in each special case. Long-standing deformity may demand the employment of traction, the patient being in bed for a varying period before applying the apparatus; in others, again, one need fix the trunk and lower extremity until the gradual disappearance of the inflammatory state.

The *after-treatment*, often neglected, includes massage, exercises, vibration, electricity, etc., to the weakened ligaments and fibrous structures to prevent a recurrence of the dislocation. Such treatments should be persisted in over long periods. It is almost unnecessary to say that where other conditions, such as pelvic diseases or gynecological affections, are associated with sacro-iliac displacement, the primary process should be eliminated before any hope can be held out of eradicating the trouble affecting the joint structure itself. In certain cases where non-operative measures have failed to give encouraging results, the writer contemplates

some radical surgical operations, as plating the pubic bones and wiring the sacro-iliac articulation.

To illustrate the results which follow the employment of suitable means in difficult cases, he offers the following case report.

E. McG., male, laborer, *æt.* twenty-six, referred to the writer by Dr. M. Behrend, suffering from a severe displacement of the right sacro-iliac articulation of six months' standing. There was no tuberculous history, and his history was otherwise negative, and his condition was variously diagnosed as lateral curvature of the spine, lumbago, displaced kidney and rheumatic fever. Examination revealed a severe tilting of the entire spine to the right side, with a prominence of the iliac crest, with some pain over the right sacro-iliac articulation and the right calf. The x-ray showed a complete displacement of the right ilium with separation of the pubic symphysis and displacement of the sacrolumbar articulation. He was placed in bed and traction applied for a week, without effect. He was then operated upon as previously described under forcible correction. Bed traction was continued while he remained in bed and a spine brace was specially made for him. At the end of ten days he left the hospital cured; resumed his occupation and when examined by the writer six months later the spine was perfectly straight. The writer may say that the rapid restoration to the normal in ten days exceeded his expectations. Upon inspection, while he has just remarked that the patient's spine appeared straight and that the sacro-iliac and pubic symphyses were in proper position, there was a slight tilting of the lumbar spine, shown in the x-ray, which does not appear on ordinary visual inspection.

DUCTLESS GLAND IRREGULARITIES IN BACKWARD CHILDREN.

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Even in that class of children in which the anomalies of development are not such a departure from the normal as to constitute true infantilism, the state of functioning of the glands having an internal secretion is worthy of attention. This not only from an etiological standpoint but for purposes of diagnosis and treatment as well.

Though we approach the subject with the utmost conservatism and agree with Hastings Gilford that there is only one form of infantilism which has thus far been satisfactorily proved to be due to the absence or defect of an internal secretion (thyroid infantilism), and reason from this that other conditions of defective development must be attributed to this cause only with the greatest caution, there still remains sufficient evidence to show that this is a fertile field for further investigation.

The three stipulations that Gilford requires, before admitting the endocrinous origin of any form of infantilism, appear to the writer to be excessive. These are:—

1. Local examination of the gland shows that it is inadequate.
2. The administration of the gland or of its extract to a normal person produces symptoms opposed to those which characterize the infantilism.
3. The gland or its extract given to the infantile counteracts the symptoms characteristic of the infantilism.

To the writer it seems that we are warranted in considering glandular irregularity an important factor in certain conditions of defective development even when these requirements have not been fulfilled. It is too much to expect that of all the tissues of the body those of one gland or of one set of glands would be exclusively affected. Conditions having a vitiating influence upon cell development, as tuberculosis, syphilis, cancer, chemical poisons, malaria, alcoholism, drug habits, insanity, goitre, malnutrition, and environmental influences of various kinds occurring in the progenitors, result in imperfect growth of the developing embryo. In the first few weeks of fetal life, when the ductless glands begin to appear, the cells of which they are composed also grow imperfectly; and,

unable to secrete to the extent to which they were destined, further defective development ensues and we have as a result infantilism, hypoplasia, degeneracy, call it what you will, in varying degree.

Polyglandular Irregularity.—In the great majority of backward children it is impossible to lay the blame upon any single gland. It is a question in the writer's mind whether most cases of so-called malnutrition in school-children are not cases of general glandular insufficiency. Malnutrition in childhood is more than a question of insufficient food. We find it among the children of the well-to-do as well as among the poor. It is not rare to find an excellent state of nutrition where the food supply is scanty. The malnutrition which is severe enough to be reckoned with as a factor in faulty development is usually hypoplasia plus malnutrition, sometimes entirely dependent upon the hypoplasia, often further complicated by insufficient or faulty diet.

The condition may be congenital or acquired during infancy or in early childhood, following any of the causes named above as having a vitiating influence upon cell development. Among the early symptoms to be noticed are delay in the power of walking and talking, late closing of the fontanels, slow growth rate, irregular dentition, extreme nervousness or passiveness. Symptoms may show themselves soon after birth or may not make their appearance until late in infancy or early childhood. In fact, early development may be more rapid than normal as the precocious child is often an hypoplastic one. Among the most prominent early signs are enuresis, lymphatism, and enlarged tonsils and adenoids. The scapoid scapula is common among these cases. Frequently ptoses of the viscera are present, especially in the female, and postural defects are the rule in both sexes. Puberty is delayed in both sexes, the boy is likely to retain the falsetto voice and bodily proportions of childhood, and very often a corresponding psychic insufficiency. The girl also retains the body form of the child, closely resembling that of the boy.

Noble gives an excellent description of these females as they come to the gynecologist, later on in life, for various irregularities of the generative organs. Kepler finds an intimate relation between physical and mental congenital stigmata (hypoplasia) and procidentia in the nulliparous.

The high-arched palate, produced by the yielding of the palatine bones owing to their relative poverty in calcium salts, which in its turn may be due to early thymic insufficiency, is a fairly constant symptom. The temperature is apt to be unstable, slight disturbances, emotional or systemic bring about changes out of proportion to the cause.

With a polyglandular condition to treat, the indication is for polyopotherapy. The writer is in the habit of using tablets made up

especially for him by an English firm, using a somewhat different formula for boys and girls, differing in that the formula for the girls contains ovarian and mammary extract in the place of testicular. Both contain small doses of pituitary, thymus, thyroid and suprarenal glands. With this treatment, when possible, is administered other necessary hygienic and educational measures. The usual result is improvement in nutrition, increase in height, increase of blood-pressure, decrease of pulse-rate, and improvement in mentality.

That much of the success is due to the glandular treatment is proved by the fact that in many cases seen in private practice and in the pædiological clinic of the South-Side Hospital, in which it was impracticable to carry out any measures other than the administration of the extracts, marked improvement took place. The belief of Dupuy in the use of the glandular extracts in the treatment of defective children is so firm that he recommends that the state should distribute them freely to be used in their treatment. While the writer believes that in those cases, in which the condition would appear due to, or at least accompanied by, polyglandular involvement, the indications are for the administration of the various glands, this is not necessary, as the relationship between the glands is so intimate that the administration of the extract of one gland seems to regulate the action of the whole system of glands. The writer has repeatedly seen improvement follow the administration of thyroid, thymus and even ovarian and mammary extracts given alone when the combination was not easily obtainable. Care, however, should be used in regard to the use of thyroid, as toxic symptoms are liable to follow unless given in very small doses and in properly selected cases.

Hypothyroidism.—The clinical picture of true myxedema is well known and its description is outside the province of this paper. There are, however, numerous cases in which while there is neither physically nor mentally a great variation from the normal, yet there is sufficient to justify interference. In these cases there is often a slight puffiness or doughiness of the face, a peculiar waxiness with occasionally a pink tinge suggestive of thyroid inadequacy. It is often a matter of difficulty to make sure by palpation of the presence or absence of the thyroid gland, but the writer believes it is safe to say that a thyroid too small to be palpated is inadequate, in childhood at least. Subnormal temperature is a fairly constant symptom. Enuresis has been attributed to thyroid insufficiency, but of late years the writer is inclined to believe it to be rather a symptom of general hypoplasia. Deficiency of the eyebrows, especially of the outer third, the *signe du sourcil*, is considered another symptom. Marked roughness and dryness of the skin is sometimes found.

The mentality is sluggish. Mental capacity may be little below normal, but reactions are slow unless under the spur of special stimulus. When hypothyroidism is suspected, thyroid extract should be administered, beginning with small doses, as low as $\frac{1}{4}$ gr. twice daily and gradually increasing until slight toxic symptoms appear.

Hyperthyroidism.—Enlargement of the thyroid gland, with rapid irregular pulse, nervous instability and irritability, are often found in children. In these cases a distinctly enlarged or boggy thyroid may be made out. Enlargement of the thyroid, the writer has found extremely common in juvenile court cases, especially in those which might be classed as constitutional psychic inferior and incipient dementia præcox cases, and in girls who have been accused of offenses against morality. In these cases the writer has found the formula used in polyglandular irregularities to be of service, with the thyroid extract reduced to a minimum, or omitted entirely. Rest, quiet and the sedative measures followed in the hyperthyroidism of adults should also be used.

Thymus.—Because of the important rôle played by this gland in calcium metabolism, it would seem to be concerned in disorder of growth in children before the age of puberty. The writer has not found attempts at determining the condition of functional activity of the thymus gland to be particularly satisfactory.

Pre-sternal dullness or resonance is suggestive but not conclusive, and radiographic studies have been equally unsatisfactory. The writer is in the habit of administering thymus gland, either in the form of the dried extract or better, when possible, in the form of raw sweetbreads, to young children who show faulty bony development. Radiographic studies of the bones of the wrist are valuable in this connection.

Pituitary.—Hypophyseal insufficiency is evidently the cause of that type of infantilism presenting excessive obesity with marked lack of genital development known as dystrophia adiposo-genitalis (Frœhlich's type). The same cause is evidently an important factor in the infantilism of the *type Lorain*,—weak, delicate, undersized individuals, with the bodily proportions of the adult, though lacking secondary sexual characteristics. Pituitary feeding is indicated in many cases in which the condition is not sufficiently marked to constitute either the type Frœhlich or the type Lorain, but still deviates sufficiently from the normal to require attention.

Pineal.—Dana and Berkeley have for some time been making a study of this gland under a grant from the Rockefeller Institute. They believe that the pineal gland has a definite and important function—namely, that it promotes the development of the human nervous system, and they presume that it supplies a minute amount of intracellular ferment accelerating the growth of the gray matter

of the brain. In administering the gland to defective children where there was no grave organic defect of the brain, the mentality showed a steady and gratifying improvement lasting over the whole period of administration. Owing to difficulty in procuring a satisfactory preparation of the gland, the writer has until very lately been unable to carry out any extended experiments. Recently, however, he has obtained the preparation from the same source as that used by Dana and Berkeley; and, while results have been very gratifying, observation has as yet not been sufficiently extensive to warrant conclusions.

A CRITICAL ANALYSIS OF A SERIES OF SEVENTY NEUROSURGICAL CASES.*

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AND

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NEUROLOGICAL SECTION (DR. SCHWAB).

It seems worth while to us to attempt a tentative solution of the problem presented by a neurological case, the chief therapeutic procedure of which is surgical, by submitting to analysis a series of cases seen and studied for the most part by both of us in the past year.

These cases, with a few exceptions, were studied in the wards of the Washington University Hospital or Children's Hospital where every opportunity was at hand for careful observation, the obtaining and recording of data, and the aid to diagnosis which sufficient laboratory equipment, specialistic skill, and efficient assistance naturally afford.

The patients were selected from the out-patient department of the surgical and neurological clinics of the Washington University Hospital and from outside sources. Those which seemed to show a possible surgical side were studied from the neurological point of view first, and, after consultation on the point of their potential operative possibility, certain of them were transferred to Dr. Sachs' service. After they were transferred, an independent examination was made, and the data derived from this examination was tested and compared with my own as a preliminary basis for further study. After further examination, depending upon the difficulty and complexity of the case, a conclusion as to operative possibility or not was finally reached. From this point on the case was regarded as surgical under the direction of Dr. Sachs. The operative indication was set, the operation planned and carried out by him, with the neurologist from now on an interested spectator. Each patient, therefore, was studied at least three times from an independent point of view, and when the final filtering process took place all possible sources of information had been gone into.

*Read before the St. Louis Medical Society, April 11th, 1914.

We have come to believe that this method of cooperation steadily carried out will in time yield results which should make of neurological surgery, in spite of the difficulties which are naturally inherent in the subject, a more encouraging field of medicine than it is at the present time.

From experience and observation in the larger clinics, such as Berlin, Vienna, London, Baltimore, Boston, and New York, naming only those where a recognized neurological surgeon is at work, we have become convinced that the best results will follow where a competent surgeon, neurologically trained, and a neurologist work together. A critical examination of the work at such centres will show that the more of a neurologist the operating surgeon is, the more intense becomes his work and the broader his sphere of activity.

The actual cooperative effort, which we present here, appears perhaps the best adaptation of the two specialties focusing, as they do, upon an individual patient every resource of clinical experience and technical skill which happens to be in the possession of both surgeon and neurologist.

The growth of neurological surgery has been dependent upon the increase of our knowledge of the physiology of the nervous system, and then upon the close differentiation of disease types, then upon the experimental study of the cortex, and finally upon technical methods which have been largely the result of intensified efforts in the hands of the surgeons whose names are associated particularly with this branch of surgery.

At the present time, however, there is great need of a more careful differentiation of the operative and nonoperative type of case and a much keener analysis of the initial symptoms and of diagnostic findings of a greater exactness in the setting of the surgical indications before the process has advanced to permanent destruction and damage. It would seem, therefore, necessary to enlist in this effort at least two kinds of neurological intelligence; a purely clinical type with the outlook towards surgery as the therapeutic measure most available, and the purely surgical type with the necessary knowledge of clinical neurology. For one individual to fulfil this broad demand is in most instances impossible. It is our belief that in the long run cooperative team-work of this kind will prove its efficiency in the careful working up of cases and the more precise weighing of clinical evidence, in early and positive diagnosis, and in fashioning with more exactness the surgical efforts most likely to give the patient the essential relief from distressing symptoms and in some cases to restore normal function.

The material which we submit is to be regarded as an attempt in this direction and its analysis should point out some of the difficulties at present almost insurmountable in surgery of the nervous

system, and emphasize anew how far we are at the present time from a solution of the problem.

This series of 70 cases represents the final selection of perhaps two or three times that number which appeared at the first examination to present the possibilities of surgical therapy; of this number the present series was set aside for final study in the manner previously outlined, and of these the operative material amounts to thirty-nine. It can therefore be seen that the surgical indication was not set rashly and hurriedly, and never, I feel positive, upon any preconceived or prejudiced position. In by far the large majority of these cases, the patient was not seen for the first time by either of us. The disease was frequently far advanced and in some cases had long previously been recognized by other men. Yet, in such cases, the relief for symptoms seemed so necessary that the operative risk was largely disregarded and the attempt was made, often hopelessly, to do something which should have been done long before.

The necessary insistence for operative procedure can only come if the surgeon is convinced at first hand that the damage to the nervous system is progressive and for the most part irreparable. To put this clearly and convincingly to the patient and those most interested, it is essential that the opinion should be based upon a personal intimacy with the subject of clinical neurology, and for this a general surgeon is for the most part inadequately trained. It is this lack of intimate knowledge of the case which accounts for the long delay which in some instances has been fatal to the chances of the individual. Much time is wasted in vain therapeutic efforts based upon the assumption that most cases of intracranial lesion and cord affection are syphilitic, and the well-known tendency of intracranial and interspinal lesions toward remissions and improvement are commonly interpreted as the effect of mercury or salvarsan or whatever may be used, so that finally the patient comes to operation a poor surgical risk, due to the increase of neighborhood symptoms and to the weakening of resistance caused by intensive and long-continued medication.

It is to be hoped that there will develop a fresher interest in this subject, a more intense appreciation of the necessity for an early diagnosis, and the effort to set the surgical indications at the very earliest moment consistent with a careful clinical study of the case.

We have divided our material into six groups, chiefly as a matter of convenience. The first group embraces epilepsy, and there are 21 cases for consideration. All epilepsies were regarded as objects of surgical interest which showed focal tendencies of any sort, either in the main auræ, or in the initial distribution of the

convulsions, or if trauma of a definite sort could in any way be associated with the initial phenomena of the attack.

The dictum of Horsely has influenced us much in our study of epilepsy. This is to the effect that all epilepsy with focal character, if seen early enough, should be subjected to exploration. If this is not done, says Horsely, it is a case of criminal neglect. The organic nature of epilepsy is the logical deduction of this attitude and as far as can be seen at the present time there is no other to be seriously considered.

What is to be expected of an exploration in focal epilepsy? Obviously, except in the presence of gross changes, very little. If such a remarkable clinical phenomena as a general attack of epilepsy can be caused by changes so subtle as to escape the most careful microscopic examination of the brain in cases where the disease has existed for years, what can a surgeon be expected to see or remove, unaided by the microscope and surrounded by conditions preventing more than a superficial glimpse of the cortex of the living? Exploration really represents an effort to find an irritative process sufficiently limited which acts as the initial impetus towards further cellular cortical irradiation. It is a matter of experience that the premonitory parasthesia, slight paralysis, and weakness may be interpreted as a kind of pre-epileptic change acting long before the habit itself becomes cortically established. It is conceivable that if it were possible to explore the cortex at this stage by removal of the gross lesion or even by so changing the physical condition of that part of the cortex no further epileptic change would follow. It is this, I think, and not vague notions of intracranial pressure conditions that brings all focal epilepsy within the limits of cortical exploration. The rarely successful results following acute traumatic conditions in which epileptic attacks have been promptly stopped would appear to prove the wisdom of Horsely's emphatic dictum.

It is rather characteristic of medical therapy that a successful procedure in the initial phases of a disease does not preclude its action in later stages. So it has come about that no matter how long the focal epilepsy has lasted, without cortical exploration the case is inadequately treated. After all, exploration has its diagnostic value too. Some have revealed gross lesions of a remarkable kind, tumor, depression, etc., and these possibilities are always present in every case.

Of the twenty-one epilepsies so studied, 9 were explored, and 12 were regarded as non-operative; 2 of these are still under consideration.

In this series the convulsions were observed and studied in the hospital, and 10 of them in which the convulsions were described as characteristically focal were discovered to be general in type. This

suggests that the most important diagnostic consideration is the observation of the attack itself. Of some interest are the 2 cases of cerebellar or lower level fits as in Case VII. This type of fit was described first by Hughlings Jackson, and is frequently overlooked. Its chief characteristics are the retention of consciousness, the curious rolling of the head in the attack, with evidence in the waking state of cerebellar disturbance in station and gait, and other evidence of posterior fossa disease. In both these cases evidence of serous meningitis was found. Participation of the thyroid in cases of epilepsy is, of late, exciting some attention. It has been frequently observed and a special form of epilepsy under its name has been described.

In Case VIII of this series an enlargement of the thyroid led to the study of this condition to determine if there was ground enough to assume a thyroid toxemia as a cortical irritation producing the attack. Nothing definite enough was found, however, to justify surgical treatment of the thyroid gland.

The rôle of trauma in epilepsy is an important element as far as the operative outlook is concerned. Too often its history is assumed to be the original exciting cause, and the operation is planned from the standpoint of the seat of the trauma. Two facts are necessarily of importance here. The first is that the head trauma is very apt to be a result of the epileptic seizure, perhaps previously unrecognized; secondly, the importance of a definite localizing aura, or premonitory sensory or motor disturbance, should far outweigh the effect of the trauma on the skull surface. Case II illustrates very well the first of these conditions, and Case VI the second. In this latter instance the focal phenomena are seen to bear very little relation to the site of the injury, and probably not at all to the traumatic effects which are evident on the skull surface.

The relation of epilepsy to previous infectious disease has often been pointed out, but rather seldom does this fact receive any surgical emphasis. In all the possibilities of a localized meningitis, as the final remnant of some general infection process, should be remembered. In some of these cases it seemed probable that the epilepsy was primarily focal in type and very likely dependent upon an origin of this kind, but later the attacks became general, the focal character was masked and surgical interference seemed to offer little promise. It is very likely, on the other hand, that most epilepsy begins as a focal or limited attack, and it is essential that this phase of the disease development should be made the object of more intensive study, if surgery is to be at all effective. This is amply proved by a study of the epileptic series, Case II.

A word should be said in respect to the localizing value of the aura. It is best to regard the aura not as something apart, but as the initial step in the attack, and as such it has a distinct surgical

interest. We have endeavored always to study the aura with this end in view, but our efforts have often been blocked by the limitation of our knowledge concerning them; particularly is this so of the localizing value of the sensory type of aura. In Case XIV, for example, a whistling preceded the attack. In Cases IV and XI there was distinct visual sensations, color and taste preceptions. All these we feel sure are the explanations of an irritative process which signify the initial point of irritation. It should be to an exploration of these regions that the surgical effort should be aimed. We are unwilling as yet to give any positive conclusions in regard to our epileptic experiences; but the study of a series of epilepsies with a possible surgical outlook has been of the greatest value in pointing the way along which further investigation is necessary.

In Group 2 are included 18 cases showing various types of intracranial lesion largely without the complicating factor of epilepsy. These represent for the most part intracranial new growths or limited focal lesions of one kind or another and present a most difficult problem. Dr. Sachs will touch particularly upon the surgical point of view in his paper. This series represents a rather remarkable lot of cases. Of the 18 cases, 8 were lesions of the posterior fossa in 2 of which the pons was involved. The remarkable high proportion of cerebellar cases appears very interesting, and we have no explanation at hand. Practically all of them were old cases with symptoms that were longstanding. In some of them the diagnosis of tumor had been made, but operation was delayed or advised against for some of the reasons touched upon in the beginning of this paper.

In Case XXII the lesion had undoubtedly lasted at least seven years, and I am ready to admit that when I first saw the case seven years ago, it did not appear to me then to present any operative possibility. After the lapse of this time I saw the case again in the clinic, and after much debate it was decided to explore the posterior fossa. The condition found showed how far we had advanced during this time, for the patient recovered from the operation to die six weeks later of cerebrospinal fistula. The lesion found was a cyst involving both lobes of the cerebellum. Of great interest is the case of posterior fossa growth in a child in which pain and choking of the discs were not present until a few days before the operation was done. Of this class is Case XXIII in which the diagnosis was made when the discs were apparently normal, when headache was an insignificant feature in its clinical picture. It is very likely that the sutures in infants and young children are sufficiently elastic to compensate for the increase of intracranial pressure.

The difficulty in distinguishing between the posterior fossa and frontal lobe processes was continually present in our minds. In

2 cases, only one of which is contained in this series, Case XXI, the lesion was not recognized. In this case there were two abscess cavities in the tips of both the frontal lobes, which apparently gave no symptoms. In the other case (localized purulent meningitis) there was characterized tremor of the arm which escaped our interpretative efforts.

The temporosphenoidal syndrome has been constantly in our minds. There are 3 such cases, XXIII, XXXII, and XI. The chief symptoms of lesions in this region are dreamy states, particularly in those cases in which the tip of the lobe in the region of the uncinate gyrus is involved. There is some times an aura of an unpleasant olefactory or gustatory sensation.

There is little to say of our cerebellar cases. For the most part they were desperate: either children with processes far anterior or adults with the processes far advanced. What method is there to determine the degree of surgical risk that patients of this sort have? The most painstaking care reveals nothing much out of the way as far as the circulation and the general condition of the patient, and yet so few survive. It seems, at the present time, to be largely a matter of chance, as we are in possession of no means by which we can measure their resistance against operative procedure. It is possible that a tumor in the posterior fossa causes its contents to be in a condition of continuous vasomotor instability, owing to the tremendous tension in that very restricted place. It is this instability which renders operation here so unexpectedly fatal in some cases, while in other cases the operation presents no great danger. A great service could be done if someone would devise a means by which operative risks in posterior fossa lesions could be measured.

In Group 3 there is collected a series of spinal cases to which the term 'myelitic' has been given. We mean by that focal diseases of the cord as distinct from primary tract degenerative processes. The chief interest in this series is in two of its possibilities: tumors and local meningitis, or inflammatory processes. Both of them give practically an identical group of symptoms. The diagnostic problem is not very difficult, because as soon as there is present a segmental distribution with a proper involvement of reflexes and muscles, a limited lesion of the cord must be assumed. Notwithstanding this, it is rather hard to explain why so many cases of this kind are allowed to go on for so long without an exploration being advised or attempted. In 2 of the 6 cases, extramedullary tumors were found, both of them non-malignant. In one case the condition had existed for seven years and in one for two years. As in the epilepsies, trauma as an etiological factor is frequently a source of error and often seems to obscure the picture. It should be remembered here that a fall is frequently not the cause but the effect

of a continuously progressive process in the cord, producing by compression disturbances in the sensory or motor pathway which render movements in the upright position less secure and certain.

The posterior root section cases are included in Group 4. These have to do largely with cases of spasticity in which the Foerster operation has been done. There are 3 such cases. It is difficult to say at the present time just what place in surgery this operation has come to occupy. Originally devised upon the ground of experimental evidence on the tonus mechanism of the posterior roots, it has not proved by itself an efficacious measure, nor to my way of thinking as effective as the peripheral operation. In Case XLVII in this series, a combined operation of posterior root section and alcoholization of the over-active muscle group has been done, and that seems at the present time to meet the requirements more fully.

Posterior root section should be of advantage in reducing the spasticity of the flexor muscles of the trunk, as these are quite beyond the reach of alcoholic injection. In purely spastic cases the upright position must be secured in order to make the gait effective where the adducted position of the legs and the over-flexion at the knee are corrected by obturator and popliteal alcoholization. This has come now to be our usual procedure, and has been done in some cases not included in this series. In cases of myelitic spasticity where the exploratory laminectomy does not reveal a definite or limited lesion, it would seem a very reasonable procedure to cut a series of posterior roots as a method of relief to the spasticity, particularly if pain is present in the spastic territory. The root section still seems too hazardous an operation to be carried out as a routine measure in children, the subjects of Little's disease or allied conditions.

In Group 5 are included 5 cases of pituitary tumors in 4 of which operative efforts chiefly of sella decompression was attempted. There are two things that a review of this series brings out very clearly. The early recognition of the lesion is essential for the complete success of operative measures on account of the development of neighborhood symptoms. The second is that the early signs of this disease are very typical, so much so that the diagnosis should at least be suspected in every case of visual field defect, not explained on other grounds.

It is obvious that long before the nutritional changes caused by the perverted activity of this gland are found, the optic nerve is as a rule interfered with. This shows itself clearly by subjective visual defects or by the usual ocular examination. There is no intracranial condition in which the x-ray examination is of such value. In all of the 5 cases in this series the enlargement of the abnormal condition of the sella turcica was discovered. The diagnosis is thus

made certain and with these two diagnostic aids, cases should be interpreted very early and the operative measures promptly instituted. As it is now, almost all cases are submitted to operation too late to attempt more than a palliative decompression, which at most cannot remedy the visual defect in the presence of atrophic process already present in the optic nerve.

In the last group is contained a number of cases of a miscellaneous kind of which no definite classification can be found. They present many interesting diagnostic problems.

In Case LIV the lumbar puncture had no apparent effect on the tinnitis aurium in the Ménière complex contrary to Putnam's experience. The section of the auditory nerve was considered but given up on account of involvement of the other ear. In the very few cases of auditory section that have been published this point is not alluded to. In Case LV paretic symptoms developed promptly after head trauma in a patient with positive Wassermann reaction in the spinal fluid and blood. It might be suggested that perhaps Wassermann tests should be a routine procedure in all serious head injuries.

In Case LVI there is found a persistence of subjective pain after the evulsions of the sensory and motor root of the trigeminus, although a complete anesthesia was produced in its peripheral distribution. The case seems to illustrate the possibility of so-called central pain, which is projected at the surface according to its original distribution. Case LX illustrates again the value of a Wassermann test in the presence of severe head traumata. The fact that syphilitic manifestations on the part of the nervous system may develop after traumata of the cord or brain, which up to that time has been quiescent, is worth noting.

A study of a series of this kind, under the conditions which have been outlined, serves to intensify our knowledge concerning a very serious group of cases, and holds out constantly the hope that some method may be devised of accurately recognizing the type of pathological process present and a sufficiently accurate localization to warrant surgical treatment before destruction of tissue has advanced too far for restitution of function.

Even at the present time, quoting from H. N. Tooth's paper read in London last summer, "the fact is that most cases of intracranial tumor need operation perhaps sooner than later, and the risk has to be taken. But what is quite as important, the survival period might in the majority of cases be greatly prolonged, and after all this is the true test of success in dealing with this class of malady."

SURGICAL SECTION (DR. SACHS).

In considering a series of cases such as this, it is well first to make clear from what point of view I propose to deal with them. In different types of diseases, a cure means different things, and does not necessarily mean a return to an absolutely normal condition. Thus a cure of a case of appendicitis is a very different thing from a cure of a case of amputation, for in the latter, the patient, though cured, remains a cripple for life. After removal of the appendix or one kidney, an individual may live on, quite undisturbed. The moment, however, any brain tissue is removed or even incised, it is quite certain to lead to a certain amount of disability, for none can be spared. We must, therefore, be satisfied with cures in which the patient may have some disability. This does not always occur, but does frequently. Then, too, in quite a number of cases, we must be content with a palliative cerebral or sella turcica decompression, either because we are unable to reach the tumor, or because the tumor has reached the inoperable stage.

Such a case was LI, pituitary tumor. A sella turcica decompression, however, has relieved the patient so that he has been back at work for over a year and feels quite well. Case XXIV also was such a case where a cerebellar decompression relieved the symptoms but the tumor could not be reached.

We have emphasized, on various occasions, the importance of getting hold of cranial cases early; that has been the cry for a number of years. In our work we have made the operative indications different from those that have been heretofore customary. Up to the present time, it has been the practice to postpone operation until there was destruction of nervous tissue, which is like waiting until a carcinoma of the stomach is palpable. We have operated earlier and, in many cases, in the absence of those cardinal symptoms generally considered essential, even when no changes in the eye fundi were present, as in Case X.

These might be considered insufficient grounds, but the repeated examinations every case was subjected to by Dr. Schwab and myself, as well as the special ones of Dr. Sluder and Dr. Koetter, Dr. Ewing, and Dr. Wiener, make us feel that we were justified in setting the indications we did. To employ the indications we have made use of, one thing has been essential, and that was to reach a point in our technique where we could feel that exploratory craniotomy was attended with the lowest possible mortality. In the past fourteen months, the abstracts will show you that we have lost but 2 cases of cranial exploration, though they record a number of fatalities. The fatal cases, with the exception of Cases XIII, XIX, and XXII, have all been inoperable tumors. Of these 3 fatal cases

I shall speak again later on, as each represents one of the complications that is not uncommon in intracranial surgery.

Now as to procedure in the different classes of cases. Epilepsy, when frankly focal, in the presence of a negative Wassermann reaction, becomes immediately a surgical condition. There is no excuse for delay, for continued epileptic convulsions not only weaken the patient, but make the cerebral cortex so irritable that removal of the irritating focus may be of no avail as the cortex has become epileptogenous—that is, has developed the epileptic habit. This prolonged delay is well illustrated by Case XIX.

I am convinced that not enough attention has been paid to a study of the auræ in epilepsy, and that many cases with a sensory aura have been overlooked; we have taken all suspicious cases into the hospital for observation, and among these, have found a number that required operation. Case XI brings out the importance of being guided by the aura in order to determine the site for operation. This case was operated elsewhere on his occipital lobe, although there was a definite temporal lobe aura—the key to the situation—which, however, was disregarded. In many focal epilepsies changes in the eye grounds do not occur, nor are changes in the color fields noted; but at times the fields may show the typical interlacing described by Cushing, in the presence of a normal ophthalmoscopic picture. Case XIX showed this very strikingly. This attitude concerning epilepsy is in accord with that of my former teacher, Sir Victor Horsley, who at the last International Congress again expressed the view that not to operate on an epileptic with focal symptoms was a crime.

Brain tumors without epilepsy—the next group—present the greatest difficulties and require the greatest resourcefulness and care. Case XXX illustrates certain of these points particularly well. This patient had a rapidly progressing cerebellar tumor. The parents kept delaying operation. The night of the day the parents consented the patient became unconscious and stopped breathing. Artificial respiration revived the child, and in the morning we did a subtemporal decompression. The tension of the dura was so great that before opening it a ventricular puncture was made through the frontal region. A lumbar puncture where a cerebellar growth is suspected I never do, and consider absolutely contraindicated on account of the danger of medullary collapse. After considerable fluid had been removed, the dura was opened and no prolapse of the brain occurred. The patient's acute symptoms were temporarily relieved, and a week later a suboccipital exploration was undertaken. When the dura was exposed, it was found to be so tense that a ventricle puncture was done through a small trephine opening over the occipital lobe, and when the pressure had been sufficiently reduced, the dura was opened.

In cerebellar intracranial pressure cases, ventricle puncture prior to opening the dura is necessary in order to avoid prolapse of the brain, or rupture of vessels or of the cortex itself. In making these punctures, the configuration of the ventricle in relation to various portions of the cortex must be accurately known, and in ventricle puncture through the occipital lobe, it is important to avoid the fibres of Gratiolet so that no visual disturbance takes place. A puncture should always be made through the centre of a convolution and the sulcus be avoided, for that is where vessels may be injured. Through a very minute opening it is impossible to determine whether one is over a sulcus or not, and this difficulty constitutes the great objection to the Neisser-Pollak brain puncture for diagnosis. When, however, a tumor is above the tentorium of the cerebellum, lumbar puncture relieves the pressure before opening the dura, perfectly satisfactorily. Though in cerebellar cases, lumbar puncture is contraindicated, it is the method to be used in cases where the tumor is above the tentorium of the cerebellum.

The question of operating in several stages is one that has received much consideration. My rule, where the patient's condition becomes at all precarious, is to do a several stage operation—two or more if necessary. A falling blood-pressure warns us when to stop, and we take it continually during intracranial operations; 70 mm. is a danger mark, and it is most dangerous to continue after the blood-pressure has dropped as low as that.

In arriving at a localizing diagnosis, I always emphasize the sequence of the development of symptoms, and in this question, subjective symptoms are as important as objective ones. This is strikingly illustrated by a patient seen some years ago, whose unilateral motor convulsion was always ushered in by an aura of the tasting of blood, and whose lesion was in the temporal lobe and not in the precentral gyrus, as the motor portion of the convulsion might have led one to believe. Case XI is another in point. In this man, the temporal lobe syndrome ushers in his convulsion, and when we operate, that is the region we propose to explore. The type of dizziness, particularly the direction in which the patient falls, as well as his subjective sensations in regard to the appearance of the ground before him, are signs of great value in localizing a cerebellar lesion. Such a patient when walking on a level surface will imagine the ground slopes to the right or left as the case may be, or he will imagine he is walking up hill or down hill. These latter sensations arise from the vermis and the former from the lateral lobes. The Bárány turning and pointing tests we make as a matter of routine, but as yet I have never found them to help in making a localizing diagnosis or to establish the position of a lesion that had not already been located by means of other symptoms and signs. I believe, however, that in every posterior fossa lesion a bilateral ex-

posure should be made. The advantage of having a larger field to work in, and of being able to displace one cerebellar lobe while exploring the other, is only possible if both sides are exposed. The possibility of free exploration in the posterior fossa is at best not very good, and therefore it is important to make use of every advantage. Such a cyst, as had Case XXVII, which was located far forward in the region of the 8th nerve, could not have been reached through a unilateral opening. There is the additional advantage in the bilateral exposure that no muscles are divided. This means less bleeding, and most important of all, makes a more secure closure over the cerebellum, for I always sacrifice all the bone in exposing the cerebellum, and do not believe in an osteoplastic flap in that region. These careful closures take a considerable time, but it is well spent when one comes to open such a wound a second time.

As regards the myelitic group, I only want to emphasize what Dr. Schwab has already pointed out, and which Case XLIII illustrates—that, given a myelitic process with a definite level lesion, exploration is indicated, for it is impossible in the atypical case to know the type of lesion we are dealing with.

Exploration of the cord should be a harmless procedure attended by no mortality either in children or adults. In our series we had one death, a patient who had been shot in the spine. His condition suddenly became bad on the operating table, so that the operation had to be stopped. The patient had been chair-ridden for three years and his sudden death suggested a fat embolus, but a complete autopsy was refused, so that that is merely conjecture.

Case XLIII emphasizes the futility of prolonged delay. This case was treated for six years as a specific case. If specific treatment is to help a patient at all a few weeks or a month at most should suffice to demonstrate its efficacy. The cord had been compressed so long that it could not recover even after the tumor was removed, so that the patient continues a helpless invalid.

In regard to posterior root sections for spasticity, I feel that that operation in itself does not relieve spasticity entirely. We are combining it with tenotomies, and Drs. Schwab and Allison's muscle group operation. We only do the posterior root sections in very severe cases of general spasticity. In the operative procedure, which we always do in one stage (two stages are quite unnecessary), we use extreme care not to get any blood into the spinal canal. Any hemorrhage while cutting the roots must be carefully avoided. Blood in the spinal canal is the cause of a great deal of postoperative pain; it may lead to permanent paralysis through scar-tissue formation, and is the principal factor in transient bladder paralyses. It is also very important to stimulate the fibres before cutting them, for the posterior root does not always form the

posterior part of the nerve as it leaves the canal, and therefore, unless we do stimulate, we run a great chance of cutting motor fibres.

There has been a good deal of discussion whether bipolar or unipolar stimulation is to be preferred in neurological cases. In these cases there can be no question whatever that bipolar stimulation is the only proper method, for with the unipolar method, the current spreads from the posterior root to the anterior, giving muscular contractions where only a sensory nerve is being stimulated.

In regard to pituitary cases, I feel we have barely begun to attack this problem in the most satisfactory way. Up to the present time a palliative sella turcica decompression is all we have done, and that is all we can hope to do by operating through the nose. When the tumor is of any size, I feel the only approach is through the anterior fossa by the method of McArthur. The pituitary problem is essentially one of an intracranial disease, and the study and interpretation is a matter for the neurological surgeon to deal with. General intracranial problems are involved, and I do not believe these are cases for the rhinologist to treat, even if Hirsch and others can do the mere operative procedure through the nose just as deftly. These cases are not, in my opinion, as easily classified as has been recently claimed. Every case presents a mixture of symptoms referable to the anterior and posterior lobes of the pituitary, and while there may be hypofunction of one part of the gland, there may be hyperfunction of the other; then, too, combined with these symptoms may be others arising from the temporal lobes and 3d, 4th, and 6th cranial nerves. At times the picture may be even more confusing through involvement of other ductless glands. Case LII is a case in point. This patient presented a typical picture of hypophyseal disease, with complete blindness in one eye and temporal blindness in the other; sugar constantly present in the urine. The sugar was interpreted as a pituitary symptom, but autopsy showed the typical lesions in the pancreas described by Opie as characteristic of pancreatic diabetes, hyaline degeneration with compensatory hypertrophy of the islands of Langerhans. The prognosis in these cases must always be grave, for even with slight symptoms, patients may have an extremely large tumor which cannot be even conjectured. Thus in Case XLIX the growth had perforated the base of the skull and invaded both malar bones. The x-ray gave no clue to this fact.

Of the last group of cases I have but a few words to say. In the matter of the nerve anastomoses, early operation is essential for good results. As soon as the reaction of degeneration has appeared, there should be no further delay in operating. Case LXVI is a typical example of this long delay—a rupture of the brachial

plexus. This case should have been explored at the end of a few weeks, but now, at the end of three years, the prognosis is hopeless. In the matter of trigeminal neuralgia, we resort to evulsion of the sensory root behind the ganglion (the Spiller-Frazier operation), if alcohol injections have given no relief, or if several roots are involved, including the first. Injection of the first branch of the 5th nerve into the orbit I consider too dangerous a procedure to be justifiable.

Now as to the operative procedures themselves. There are certain conditions that, it seems to me, must be fulfilled to do this work properly. There is no group of cases in which the anesthesia is of greater importance and means more as to the ultimate outcome. Postoperative vomiting, where there is increased intracranial pressure, particularly in cerebellar cases, may be a most serious complication, and for that reason, for the past year or more, we have done these cases exclusively under intratracheal anesthesia. I never undertake an operation of this sort unless I have our regular professional anesthetist in charge of the case. She has learned to keep the patients under a very light anesthesia. Deep anesthesia is never necessary, and very undesirable in all cranial cases, as it unquestionably increases the operative risk. Only second in importance to the anesthetist is a trained corps of assistants, one of whose most important duties is careful hemostasis. At times, even with the most painstaking care, hemorrhage, which results in disaster, may be encountered. Such a case was XIX in whom the blood-supply of the tumor came from the middle meningeal artery which ran in the bone. This was injured in making the flap, and before the flap could be turned down, a very considerable amount of blood was lost. It was a mistake in judgment, I believe, not to transfuse that patient. For this purpose we are now prepared to use the Kimpton tubes, which makes the entire procedure a much simpler and more rapid one. This was one of the three fatal cases to which I have referred already. There has been much futile talk about the kind of instruments best adapted for opening the skull. It is merely, in my opinion, a matter of getting accustomed to one's tools. I am, however, unalterably opposed to electrically driven instruments. They are distinctly dangerous, and are bound to do harm. Several weeks ago I had an adult's skull that was so thin that mere pressure with the perforator made a hole. It was as thin as heavy paper. An electric saw would have torn into the dura. I do, however, believe that the proper armamentarium is necessary for this work. Chisels and mallet are absolutely to be tabooed, but essential for effective work are a number of bone forceps especially adapted to work about the foramen magnum, and over the sinuses, and a proper set of brain spoons curved so that on retracting the brain, the edges do not lacerate the brain. For posterior root sec-

tions, and nerve anastomoses, proper very fine hooks and nerve separators are required. Then, too, for cerebellar cases a special table is necessary so that the patient lying on his face still breathes freely, and for this purpose I use a table on which the patient rests, supported by his forehead and shoulders, with the chest free. To meet all these conditions, it has been essential to do all our work in one place where the cases could be worked up and then operated with the same team of trained assistants and anesthetist.

These details are matters which are essential for effective neurological surgery, but much more is necessary. The opening of the skull or the spine is like the skin incision of the abdominal surgeon. It is after we get the brain or cord exposed that the most important work begins. In handling the brain, an entirely different method of manipulation must be used than elsewhere in the body. To wipe the intestine with gauze may lead to injury of the peritoneum and consequent adhesions. To wipe the cortex means minute subcortical hemorrhage—destruction of cortical cells—loss of some function. Therefore we only use cotton, usually wet with salt solution at 118° F., the temperature which Horsley found best to stop hemorrhage on the cortex. This hemorrhage may also be controlled by bits of muscle placed on the bleeding point. These cases cannot be done properly, with due attention to detail, if hurried. Time is an unimportant factor in these operations, and one or at most 2 cases are all that can be properly done in a day. The long anesthetic, if well given, does no harm. It is the loss of blood that is the cause of what in so many of these cases has been termed shock.

The methods of electrical stimulation must be understood, and acquired from prolonged practice. It is not merely a question of unipolar or bipolar stimulation, but also the effect of electrical stimulation on the cortex and how anesthesia may affect the cortical response. A minute knowledge of the fibre tracts is important, for in attacking deep-seated tumors we must know the course of the fibres so that we may avoid important ones. A thorough understanding of the circulation of the cortex will be endangered by tying certain vessels; otherwise local necrosis may occur. These and many other points in regard to the anatomy and physiology of the brain and cord must be known if one is to do neurological surgery effectively.

In presenting this study, our object has been to review what to us has been a very instructive mass of material, and to point out where and how advances in neurological surgery may be made. Our recoveries have not been very high—66 per cent.—but in analyzing our 8 deaths in craniotomies, 3 of these cases were absolutely inoperable: Case XXVIII an extensive basal fracture, and Cases XXIII and XXVI infiltrating gliomas that had invaded the pons and

cerebellum extensively. The other 3 deaths represent the three most common complications of cranial operations: Case XIX, already mentioned, is the case in which the severe hemorrhage occurred; case XIII in which edema or hyperplasia of the brain occurred after extirpation of the tumor; case XXII in which a cerebrospinal fistula developed, followed by an infection after three to four weeks. We must be prepared at present for some fatalities as long as so many cases come to us at a late stage, but that should not deter us from attempting to continue, in the hope that ultimately medical men will realize that in early operation lies the greatest hope for cranial surgery.

BRIEF CLINICAL RESUME OF SEVENTY NEUROSURGICAL CASES.

GROUP I. EPILEPSY.

CASE I.—A. T., *æt.* twelve. At the age of eighteen months the patient had first attack. Left-sided convulsions, aura, paraesthesia in the left palm, dizziness, flashes of light, consciousness completely lost. Of late the gait has become unsteady. The attacks average one a month, preceded by dizziness and noises in the head. During the attacks the eyes turn to the left, the corner of the mouth is down, the left leg is flexed on the thigh in a rigid position, the right disc is hyperemic, the corneal reflex is minus on the right, the left leg is paretic. Oppenheim and Babinski signs are present on the left, no spasticity, the fields are normal, blood Wassermann test is negative.

Diagnosis.—Left Jacksonian convulsion, due to a right posterior central process, stationary in type, old inflammatory process, or slow-growing tumor.

Operation.—A large osteoplastic flap on the right; pia over central motor area thickened; no local indication for excision of cortex; dura closed; opening left in the skull.

Subsequent History.—One fit since operation—five months.

CASE II.—(Surgical No. 790.) E. L., *æt.* four. Convulsions at eleven months, right hand and face, following an attack of pneumonia. Free interval of two and a half years from the initial attack. Eight months ago the patient was struck on the head; two months later there was a return of convulsions on the right side; no loss of consciousness. Average convulsions, two daily. Physical examination entirely negative, with negative Wassermann reaction. A number of attacks seen in the hospital showed general bilateral distribution.

Diagnosis.—Generalized epileptic convulsions, starting, probably, from an infectious process located on one hemisphere. Patient discharged as unsuitable for operation.

CASE III.—(Surgical No. 829.) G. M., *æt.* twenty-nine. At the age of eleven the patient was hit on the head with a piece of ice. The attacks average one a month; lately, the attacks have increased to two or three a week. No focal element could be observed in the attacks; no scar on the head. Operation not considered.

CASE IV.—(Surgical No. 1,123.) L. B., *æt.* thirty-six. For two and a half years the patient has had epileptic attacks, with well-marked aura, which the patient cannot describe. At times he has a subjective visual sensation in which he sees himself in the act of falling. Physical examination entirely negative. A careful study of the relative degrees of temperature on the two sides of the body, with a view of lateralizing the process, showed that although

there was a subjective feeling of difference in temperature, none could be observed during his stay in the hospital. Operation not advised.

CASE V.—(Surgical No. 1,117.) J. McN., *æt.* eight. The epileptic attacks began at the age of three and a half. They had, up to the time of observation, been principally at night. Nothing definitely localized in the attacks. For one year the patient has been on a salt-free diet and small doses of bromide, with temporary improvement. With the exception of a paresis of the lower branches of the face on the left, the physical examination was entirely negative. The Wassermann and other laboratory tests were negative.

Diagnosis.—An irritative lesion in or about the right motor area, involving the face center.

Operation.—Exploration of right motor cortex. Considerable intracranial pressure so that lumbar puncture had to be done to lower the pressure. Bone removed under temporal muscle and dura left open. Infection of wound, due to pustular eruption of the scalp at the time of the first dressing. Herrington's solution had been used. (This is the only discoverable source of infection.) Fungus cerebri. Patient at end of three months has been without any convulsions; hernia said to be as before.

CASE VI.—(Surgical No. 1,041.) E. L., *æt.* forty-five, male. Five years ago the patient received a blow on the frontal region, followed a month later by severe headache. Operated on at the site of depression before coming under observation. Three years later visual disturbance. Two months ago the patient fell down unconscious, the unconsciousness lasting a few minutes. The day before admission he had two attacks of unconsciousness. The patient says he does not feel well and has lost 60 lb. in weight; he complains of nausea, bad taste in the mouth, speaks of a dreamy state which he is not able to describe; sees red things before his eyes and becomes dizzy. He does not try to move for fear of falling; objects rotate from left to right; breaks out in cold sweat. The attacks last about thirty minutes. There is tremor in the right hand. Otherwise, the physical examination is negative. He has attacks of amnesia and has anosmia; has a right homonymous hemianopsia, with marked interlacing of the color fields, more pronounced in the left than in the right. The discs are normal. Wassermann test negative. Discharging sinus at the margin of the cranio-pharyngeal sinus.

Preoperative Diagnosis.—Abscess in the right occipital lobe; a discharging sinus, with small amount of pus, at the site of the old operative wound.

Operation.—This region explored; necrosis of bone, dura intact, therefore not opened.

The patient is still under observation, and an occipital exploration is in view, if any signs of recurrence of the attacks show themselves.

CASE VII.—(Surgical No. 1,059.) C. M., male, *æt.* eighteen. Complaint: Headache and convulsions, which are said to have begun after exposure to extreme heat in July, 1913. He became unconscious and remained so for twelve hours. Since then he has been listless and has had attacks of headache and dizziness. One week after admission he had a convulsive seizure. No aura; flushing of face, movements of jaws, rolling of head, opisthotonus, generalized twitching; no unconsciousness; there was biting, scratching and hair-pulling. Restraint necessary. At first examination he was apathetic, complained of intense general headache, and his memory seemed impaired. Showed lateral nystagmus, slow movement, more on looking to the right than to the left; no corneal areflexia. In sitting up his head drops to the right; he falls to the right with eyes closed. There is blurring of the upper quadrant of the disc of the left eye, contracted fields and no interlacing. Negative Wassermann reaction. Physical examination otherwise negative. Attack observed in the hospital confirms history.

Preoperative Diagnosis.—Cerebellar convulsions, caused by an inflammatory process of the cerebellum; probable cause, an old pneumonia seven years before which was coincident with the onset of symptoms.

Operation.—Bilateral suboccipital exploration. Exposure of dura, cerebellum not pulsating. As cortex was under considerable pressure, the left ventricle was tapped through the occipital lobe, through special opening. Dura opened. Numerous dense adhesions found in the upper right lobe of the cerebellum which were divided. Dura was left open.

Operative Diagnosis.—Circumscribed serous meningitis, with adhesions. Patient improved; no further attacks noted.

CASE VIII.—(Surgical No. 1,108.) R. R., *æt.* twenty-two. Six years ago began to have epileptic attacks, preceded by sinking sensation in the abdomen, noise as of a rushing train. Otherwise typical attack, with the exception of an enlarged thyroid gland, the physical and neurological examinations were entirely negative. No subjective aura; no focal character. The temporal lobe was considered as a possible source of the focal lesion. The thyroid enlargement was studied with a view of determining whether this might be considered a case of so-called thyroid epilepsy. Wassermann test was negative. Operation not advised on account of the absence of the focal symptoms.

CASE IX.—(Surgical No. 1,078.) S. W., male, *æt.* six. Movement of the right hand, particularly at night; sometimes the left, frontal headache, dizziness, lasting half a day. Attacks said to last six minutes. Physical examination entirely negative, with three plus Wassermann reactions in the blood.

Diagnosis.—Suspected Jacksonian fit from cortical luetic lesion. Operation not advised.

CASE X.—(Surgical No. 1,183.) G. J., *æt.* forty-one. Intense headaches occurring periodically, which began six years ago; loss of consciousness, with general convulsive movements; convulsions have become more frequent of late. In the last attack vomiting continued for three days. Subjective sensation of falling to the right with slanting of the ground upwards. Babinski sign on the left, with contralateral extension of the toe on the left when stimulating the right. Discs and fields are both normal; on nystagmus; negative Wassermann reaction; caloric test negative and normal sinuses; x-ray negative.

Preoperative Diagnosis.—Posterior fossa lesion of inflammatory origin involving the middle, or possibly the right cerebellar lobe.

Operation.—Bilateral suboccipital decompression. Thickening of the pia over the left hemisphere; basal cistern thickened and opaque; tension is not plus; the cerebellar pontine angles normal on both sides. Uneventful recovery, with disappearance of symptoms up to the present time.

CASE XI.—(Surgical No. 1,185.) A. F., *æt.* thirty-six. Twenty-one years ago patient fell on the head. One year before coming under observation had epileptic convulsion. Seven weeks afterwards the second one. Was operated on occipital region of the skull and a silver plate left *in situ*. This was done before coming under observation. Since then has had attacks every six weeks. These attacks are preceded by an aura of smell of a coppery kind. Neurological examination entirely negative; x-ray examination, fields and discs are all normal; sugar tolerance normal; Wassermann test negative.

Diagnosis.—Contrecoup lesion of the temporal lobe, as a result of fracture of the skull. Patient to be kept under observation for operation on left temporal lobe. Operation has been refused.

CASE XII.—(Surgical No. 1,186.) E. H., complains of numbness on the left side of the face and epilepsy. Six months ago he fell a distance of twenty feet, landing on his head on a concrete foundation; was unconscious or stuporous, for two weeks. Recovered in five weeks, with left-side impairment of hear-

ing. Four months later had an attack of unconsciousness, progressive loss of hearing, progressive loss of memory, tinnitus in his left ear. Physical examination: Slightly diminished sensation of the lower two branches of the left fifth nerve, the eighth nerve on the left, impairment of cochlear branch. In the pointing test, the patient points to the left, with the left hand; on the right, the right hand is normal; adiadochokinesis on the left. Otherwise negative. Fields are normal, eyegrounds normal, x-ray examination normal.

Diagnosis.—Basal fracture of traumatic origin, with the possibility of a tumor of the auditory nerve.

Operation advised, but patient left the hospital against advice.

CASE XIII.—(Surgical No. 1,192.) C. B., *æt.* fifty-one. Frequent convulsive seizures in the right arm and leg. In July, 1911, was struck on the head with a garden hose, unconscious for two hours. In October, 1911, began to have headaches, with occasional nausea and vomiting. In December, 1912, began to have focal epileptic attacks, which were followed by unconsciousness. The attacks were always preceded by pain in the right arm. Convulsions have been daily for the past two months. Physical examination: Weakness of the

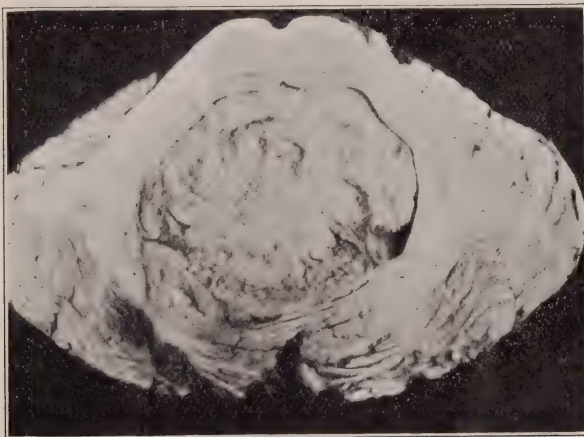


Fig. 1.—Case XXIII. Glioma involving cerebellum and pons, with marked compression of the cerebellar nuclei and the pons.

left arm, Babinski sign and ankle-clonus on the right, blurring of left disc, no interlacing of color fields, Wassermann test negative. At times there is a definite slowness of speech. Compass points not recognized as well on the right as on the left.

Preoperative Diagnosis.—Focal lesion, posterior rolandic region, involving the arm center.

Operation.—Left-sided osteoplastic flap. No increase in pressure. A cortical gelatinous growth lying on both sides of a large Krause vein. In order to remove the tumor, the vein had to be ligated and excised with the tumor. The dura was closed.

The patient died within twenty-four hours, edema or hyperplasia of the hemisphere found. Microscopical examination showed the growth to be a glioma.

CASE XIV.—(Surgical No. 1,194.) E. L., *æt.* seventeen. Four weeks ago had an attack of unconsciousness, during which he was observed to whistle and sing. Many attacks were observed in the hospital. Physical examination entirely negative. During the attacks no convulsive twitching of face; arms

are raised towards the head, with complete loss of consciousness. During the attacks he whistles shrilly several notes, and at times sings in an unnatural voice.

Diagnosis.—Focal epilepsy, interpretation impossible at the time and operation not advised.

CASE XV.—(Surgical No. 1,218.) C. S., *æt.* seven. Two years ago had epileptic attack. Knows when the attack is coming on and runs to her mother. The attacks are said to have begun on the left side, with the left arm drawn into the axilla in a flexed position. Convulsion observed in the hospital proved to be general. Wassermann test negative. Operation not advised.

CASE XVI.—(Surgical No. 665.) J. K., *æt.* forty-four. Inability to use left hand. This took place eight years ago, following a gun-shot wound of the jaw. Left Jacksonian epilepsy, preceded by aura of tingling in the

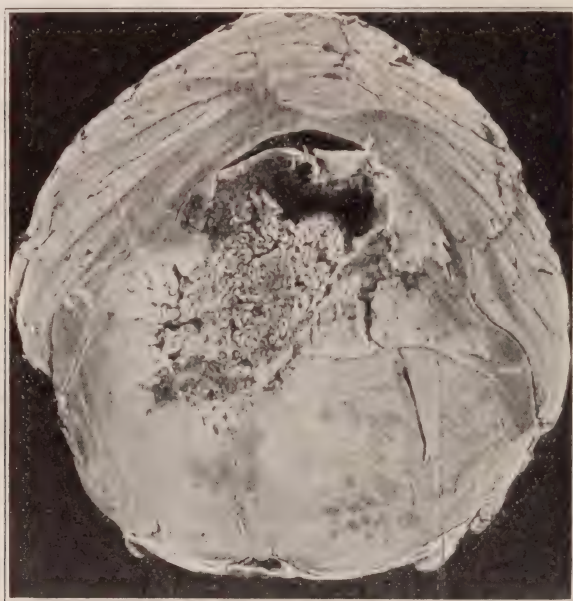


Fig. 2.—Case XXVI. Infiltrating glioma obstructing the aqueduct of Sylvius invading the pons and causing marked destruction.

fingers; astereognosis of left hand; inability to recognize compass points on the left (cortical loss of threshold of two compass points); diminished sense of position; eyegrounds and fields are normal, with negative Wassermann reaction.

Preoperative Diagnosis.—Right parietal lobe lesion, post-central position.

Operation.—Osteoplastic flap, large cyst containing brownish fluid, which occupied a large part of the parietal lobe and extended to the first temporal convolution. On the following day the patient got out of bed, fell and struck his head. A secondary hemorrhage followed, with paralysis of the left side of the body. Clot was evacuated. Patient made uninterrupted recovery. Since discharged, the patient improved and went back to work.

CASE XVII.—(Surgical No. 680.) P. B., *æt.* eighteen. Three years ago jerking of the right arm, lasting several days; gradual increase in frequency until the interval between the attacks was about two weeks; vision of the

right eye diminished, cannot feel things on the right side of the face as well as on the left; tingling on the right side of the face. Before attacks, things look queer and seem to move around. Physical examination entirely negative, with negative Wassermann reaction. Discs are normal. Convulsions were observed in the hospital and showed general character. The case is not suited to operation, as nothing focal could be observed.

CASE XVIII.—(Surgical No. 723.) J. M., *æt.* fifty-six. Chief complaint is dizziness. Fourteen years ago the patient received a heavy blow on the head, which fractured his skull. An operation at that time was done. Since then he has had loss of smell. Three years ago he began to notice that his memory was failing, and that he became dizzy. Three months ago convulsive seizures at night; abnormal irritability; outburst of anger without cause; a marked depression was found over the left orbit; fine tremor of both hands; left lower abdominal reflex absent; pulse is slow.

Preoperative Diagnosis.—Frontal lobe lesion, probably an old cyst, resulting from the former fracture of the skull.

Operation.—Osteoplastic flap, frontal region. The dura was found to be

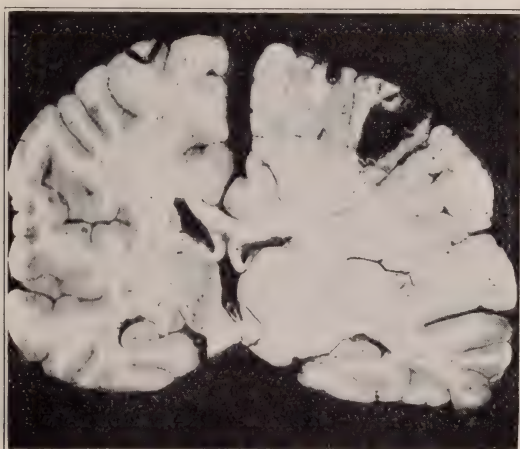


Fig. 3.—Case XIII. Unilateral hypertrophy of cerebral hemisphere on side of the tumor. The site of the glioma visible; completely removed at operation.

bound down by adhesions to the cortex. At the tip of the frontal lobe there was found a cyst containing clear fluid. The cyst was emptied and the cyst wall dissected out. Patient improved after operation.

CASE XIX.—(Surgical No. 736.) M. H., *æt.* fifty-four. Jerking of the left hand three years ago, spread to the face and arm, consciousness is not always lost. Has had as many as three attacks a day. Sensation of pins and needles at the onset of attacks. Neurological examination; slight loss of power in the left arm; reflexes more active on the left than on the right; frequent attacks of yawning; questionable astereognosis; negative Wassermann reaction; eyegrounds normal; slight interlacing of the visual field in the left eye.

Preoperative Diagnosis.—Process on the right post-central cortex; the nature of the process is uncertain.

Operation.—Large osteoplastic flap over the Rolandic area, in the pre-central region. Uncontrollable hemorrhage from bone flap, caused by the middle meningeal artery. This was found to be imbedded in the bone and

was very much larger than usual and apparently furnished the entire blood-supply of the tumor. Operation was stopped, to be continued at second stage with the bleeding controlled. Patient died a few hours afterwards. Autopsy showed an encapsulated glioma of the posterior Rolandic area, $5\frac{1}{2}$ by $3\frac{1}{2}$ cm. in size.

CASE XX.—(Children's Hosp. No. 5735.) J. S., *æt.* four yrs. and eight months. Swollen elbow five months, spasm for three weeks. Elbow swollen since injury five months ago. X-ray showed lesion of bone as in tuberculosis. Unable to walk for the last four mos. Perfectly well up to that time. Frequent headaches. Pays no attention to anybody and recognizes no one. Wassermann reaction negative; skin tuberculin strongly positive. No organisms found in the spinal fluid. Large head; distended veins over the head. Very irritable. Leg stiff and held in a Babinski position. Bilateral ankle clonus. Right arm held flexed with constant tremor. Bilateral choked disc with hemorrhages. Ventricle was aspirated with negative results. Pupils widely dilated, reactionless to light. Died eight days after admission to hospital. No autopsy. Probable diagnosis, secondary tuberculous meningitis.

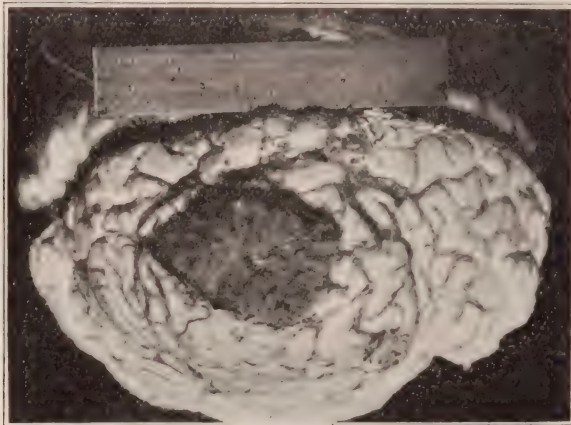


Fig. 4.—Case XIX. Large encapsulated glioma.

CASE XXI.—(Medical No. 767.) G. D., *æt.* forty-four. Complains of headache and paralysis of the left arm. Loss of sexual power for the past year. Headaches for many years. Three weeks before admission sensation of insects crawling down his right leg; headaches became much more severe. Patient became more irritable. One month later woke up and found his left arm entirely paralysed. Weakness had developed in both legs with difficulty in moving them. Three days before admission focal convulsions beginning in the right leg. Speech disturbance after convulsions with right arm shaking while in a sitting position.

Examination.—Paralysis of left arm and shoulder. Paresis of left face and both legs. Double Babinski sign; ankle clonus and increased K. J.; rapidly developing optic neuritis.

Surgical Advice.—Decompression for relief of headache and eye condition advised with exploration of the right side. Operation refused. Patient died two weeks later. Postmortem showed multiple brain abscesses in both motor areas and frontal lobes.

GROUP II. INTRACRANIAL LESIONS WITHOUT EPILEPSY.

CASE XXII.—(Surgical No. 998.) E. B., *æt.* twenty. Healthy up to six years; whooping-cough at that time. This is said to have marked the beginning of her present trouble. At thirteen years it was noticed that she had very marked tremor of the hands, unsteady gait, and become bed-ridden at the end of four years. She menstruated only three times a year. Her mental state is that of a child, with marked defect in speech; no pain or discomfort; infantile appearance. In sitting position, the head rests against the chest. The genitalia, infantile in type; marked athetoid movements of the right arm, with intention tremor and ataxia, more on the right than on the left. There is marked adiadochokinesis in both hands, more in the right; the head turns to the right, with screw-like movement. No sensory disturbance; bilateral nystagmus; hypotonia of all muscles, particularly on the right side. In sitting up in bed, the patient always falls to the right. No abnormal reflexes.



Fig. 5.—Tumor of the temporal lobe (glioma) showing the very slight deformity when decompression is well protected by temporal muscle.

X-ray Diagnosis.—Involvement of the cervical vertebrae. Negative Wassermann reaction.

Preoperative Diagnosis.—Slow-growing process in the middle line, involving the cerebellum, growing more in the right than in the left.

Operation.—Bilateral suboccipital cerebellar exploration. A large cyst was found involving the right and left cerebellar lobes, extending across the middle line. Clear fluid was evacuated and the cyst wall excised, with exposure of the floor of the fourth ventricle. The cerebellum was crowded forward to the tentorium, so that the calamus scriptorius could be seen. The spinal accessory, the vagus and the twelfth nerves could be identified without drawing the medulla aside. The wound was closed in the usual way. The patient died four weeks later, as the result of a cerebrospinal fistula, followed by infection. The only organism discovered was a micrococcus catarrhalis.

CASE XXIII.—(Surgical No. 837.) S. V., *æt.* five. Unable to walk. Five months ago difficulty in walking and has been completely bed-ridden for six months; has crying and vomiting spells; often falls backward; sighing respira-

tion; bilateral choked discs; cerebellar ataxia in both arms and legs; bilateral nystagmus; corneal reflex present; paresis of the right facial.

Preoperative Diagnosis.—Lesion of the middle lobe of the cerebellum, involving the right more than the left.

Operation.—Bilateral suboccipital exploration, preceded by ventricular puncture, to reduce pressure before opening the dura. Both lobes explored; nothing found. Death twenty-four hours later. Autopsy showed glioma of the middle lobe of the cerebellum, blocking up the sylvian aqueduct; internal hydrocephalus.

CASE XXIV.—(Surgical No. 1,139.) S. M., *et.* thirty-six. Began seven

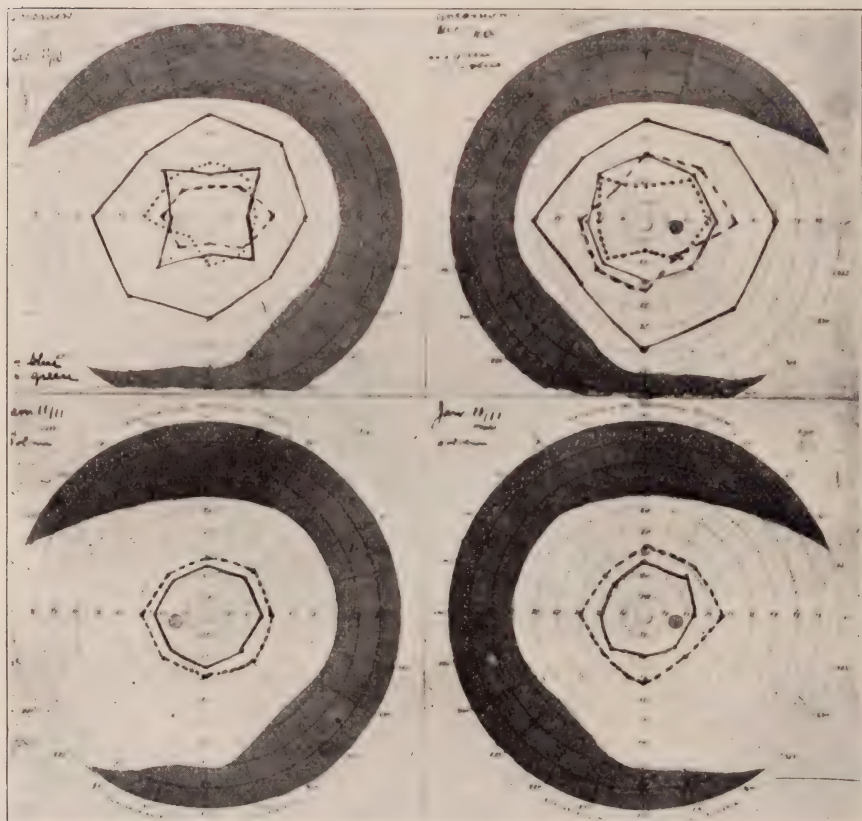


Fig. 6.—Eye fields of case shown in Fig. 5. Return of color fields to normal as result of decompression.

months ago with toothache on the left side; impairment of hearing on the left side; paralysis of the left side of the face; loss of sensation in the left half of the tongue; deviation of the tongue.

Neurological examination: Paralysis of the fifth motor, and sensory, seventh, twelfth, bilateral sixth, left ninth nerves; severe headache; corneal ulcer on the left eye; discs are normal. Wassermann test of blood and spinal fluid negative, even after a provocative dose of salvarsan.

Preoperative Diagnosis.—Basal process on the left, involving the left pons.

Operation.—Bilateral suboccipital exploration; nothing abnormal was found.

The dura was left open. Uneventful recovery. Discharged as improved, as far as headache is concerned. Lesion was probably intrapontine.

CASE XXV.—(Surgical No. 1,176.) K. L., male, *æt.* eight. Difficulty in seeing, weakness in the right arm and gradual onset one year ago with headache. Several months ago the boy ceased to use his left arm; sometime later began to drag his right leg, twitching of the left side of the face then began. Physical examination showed weakness of right arm and lower branches of right face; complete astereognosis of right hand; atropognosis of the right side of the body. Wassermann test of blood is negative; eye-grounds are normal, with a possible suggestion of retinal hyperemia.

Preoperative Interpretation.—Intracranial process of the left parietal region, post-central, encroaching on the Rolandic area. The patient developed

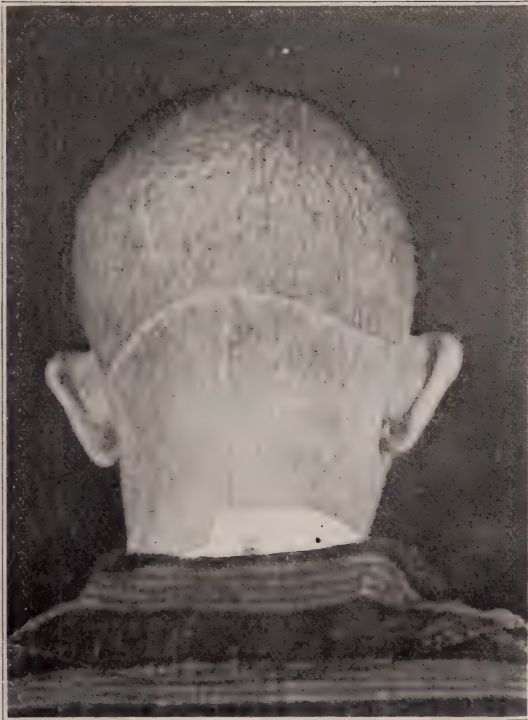


Fig. 7.—Case XXIV. Showing the typical incision for bilateral exposure of the cerebellum, ten days after operation.

scarlet fever while at the hospital, and when examined six weeks later, the symptoms had all disappeared.

CASE XXVI.—(Surgical No. 446.) E. N., *æt.* sixteen. Inability to walk or use hands, internal strabismus, headache, difficulty in urination, for two years. Five weeks ago the child began to stagger, head thrown back; complains of dizziness; difficulty in walking; swallowing and breathing became progressively difficult. Physical examination showed large head, ataxia of upper extremities, ankle-clonus; Babinski sign present on both sides, paralysis of the right fourth and seventh; nystagmus, more marked on the right than on the left; nausea, drowsiness, yawning, respiratory difficulty; rapid, progressive choking of both discs. X-ray picture showed a markedly thin skull, with no evidence of pituitary growth.

Preoperative Diagnosis.—Tumor in posterior fossa, far forward, on account of the involvement of the fourth nerve.

Operation.—Suboccipital decompression, preceded by a ventricular puncture. On opening the dura, the pressure was so great that several cortical vessels ruptured spontaneously. No tumor was found. The patient died twelve hours after from hyperthermia. Postmortem showed large glioma, left cerebellar and median lobe, completely obstructing the aqueduct sylvius, producing a high degree of hydrocephalus.

CASE XXVII.—(Surgical No. 615.) M. B., *æt.* thirty-one. Loss of sight in left eye, impaired vision of the right. This occurred five years ago, following the birth of a child. Marked mental disturbance observed at that time, with suicidal impulses; religious delusions caused confinement in sanitariums



Fig. 8.—Osteoplastic flap with decompression opening under temporal muscle. Very slight deformity five days after operation.

on several occasions. At the time of admission there was some intellectual defect, bilateral anosmia, paralysis of the right eighth nerve, nerve deafness, areflexia of the right cornea, falls to the right in walking and standing, Babinski and Oppenheim on the left, bilateral choked disc, adiadochochinesia.

Preoperative Diagnosis.—Cerebellar tumor, in the right lobe.

Operation.—Bilateral suboccipital exploration. Dura was found under such increased tension that ventricle was aspirated through occipital lobe; extra cerebellar cyst found in the region of the right eighth nerve; cyst wall excised in part. The dura was left open; uninterrupted recovery. Choked disc continuing, ventricular puncture was again done to relieve the pressure. Two weeks later subtemporal decompression. The dura was found so tense that

the ventricle had to be punctured again. After this the choked disc subsided. The mentality of the patient improved, with some improvement of the eyesight.

CASE XXVIII.—(Children's Hosp. No. 5,915.) J. O., *æt.* two years, eleven months. Patient fell on his head about 15 ft.; immediately became unconscious. Physical examination: Pupils widely dilated, reactionless to light. Cheyne-Stokes breathing. Large hematoma behind right mastoid. Absence of rising blood-pressure with marked Cheyne-Stokes respiration, and injury over posterior region indicate hemorrhage of posterior fossa with involvement of respiratory center.

Operation.—No anesthetic, hematoma found in the posterior fossa. Patient died immediately after the operation.

CASE XXIX.—(Surgical No. 719.) C. C., *æt.* fifty-one. Complains of dizziness and headaches, accompanied by nausea. Onset several months ago. These symptoms are especially marked when the patient gets up quickly, or turns to the left. The patient always seems to rotate to the left, with objects remaining stationary; lateral nystagmus on extreme position of the globe to right and left; questionable haziness of both discs; color fields show no interlacing. In upright position, the left cornea shows marked lessening of sensation, while the right is very sensitive. On turning the head to the right or left there is anesthesia of both corneæ in all positions of the head. No further cerebellar symptoms developed; ears and sinuses are all normal. Wassermann test negative.

Diagnosis.—Cerebellar lesion. In view of the progression of the symptoms, an exploration has been advised.

CASE XXX.—(Surgical No. 648.) R. F., *æt.* six. Staggering gait, headache, internal squint, daily vomiting. Neurological examination: Bilateral external rectus paralysis; bilateral choked disc; right peripheral vessel paralysis; sighing respiration, anesthesia of both cornea; ataxia of both arms and legs, more marked on the left than on the right; ankle-clonus on left; negative Wassermann reaction; vertical nystagmus.

Preoperative Diagnosis.—Tumor of the posterior fossa at the cerebellar pontine angle.

Operation.—Subtemporal decompression, with preliminary ventricular puncture before the dura was opened; frequent attacks of respiratory failure during the first twenty-four hours. One week later bilateral suboccipital exploration, with preliminary ventricular puncture before the dura was opened. Cerebellum looked normal, no tumor found; respiratory collapse during operation. Patient discharged, relieved of headache but otherwise not improved. Died four months later. No autopsy.

CASE XXXI.—(Surgical No. 572.) T. K., *æt.* forty-eight. Five years ago patient fell off a street-car, striking his head. For six weeks had loss of memory while in the hospital, cortical loss of smell, anosmia, paralysis of the right fourth nerve, tempero-sphenoidal attacks of fear, followed by subjective sensation of smell, slight contraction of visual field on the right, no interlacing of the color fields, Wassermann test negative.

Diagnosis.—Lesion of the left tempero-sphenoidal lobe. Operation contemplated, but the patient was lost sight of.

CASE XXXII.—I. N., *æt.* fifty-two. Complaint: Attacks suggestive of epilepsy, followed by amnesia and aphasia. These attacks are preceded by intense headaches, occipital in localization. The headaches are now of almost daily occurrence. During these attacks he is apt to do things at variance with his usual customs; saying things that are not characteristic of him. He sometimes appears in a sort of dreamy state, oblivious of all things around him. Neurological examination shows sluggish pupils, irregular in outline, rather

small; all reflexes are plus; no abnormal toe phenomenon. Wassermann test and x-ray examination are negative.

Interpretation.—Very suggestive of temporal sphenoidal process. Exploration advised if symptoms continue.

CASE XXXIII.—G. W. R., *æt.* thirty-seven. During the last two years has had a number of attacks of unconsciousness, preceded by dreams and nightmares. Some of these have been followed by semi-stupor lasting forty-eight hours with complete amnesia of what took place. Some of the attacks consisted of numbness in left hand and shoulder accompanied by tingling sensations. He has at times transitory attacks of blindness, difficulty in speech and general feeling of heaviness and mental torpor. He has more or less of a frontal headache all the time. Has had attacks of mind blindness. Neurological examination shows rigidity to light of the left pupil and very sluggish reaction of the right. Some difference in size, left being slightly larger than the right. Reflexes are all present and equal. No abnormal reflexes; discs are normal. Negative Wassermann blood reaction.

Interpretation.—Temporal sphenoidal or frontal lobe process. Exploration advised.

CASE XXXIV.—(Surgical No. 1,269.) M. M., *æt.* fifty-three. Pain in left side of face; failing vision, difficulty in speech. Has been treated for some trouble in nose for three weeks. Six months ago began to complain of pain in left side of face and headaches. One month ago vision began to fail, difficulty in walking and attacks of dizziness. Falls to the left side; drowsy and cries easily. Complete left third nerve paralysis, weakness of left lower face and leg. Adiadochokinesis of left hand. Temperature on the left side higher than on the right; staggering and falls to the left. Weakness of the left side of the tongue. Field of left eye contracted. Wassermann blood reaction positive. Spinal fluid Wassermann negative twice. Three weeks of mercury and iodides. Three full doses of salvarsan. Patient getting worse.

Preoperative Diagnosis.—Process in left posterior fossa. Nature not clear. Bilateral suboccipital exploration. Bone as thin as paper. Pressure normal. Fine adhesions over right and left cerebellar lobes. Dura left open.

Death from post-operative pneumonia.

CASE XXXV.—(Surg. No. 1,297.) L. S., *æt.* forty-three. Headache, vomiting, and dizziness for ten weeks. Weakness so great that patient is bedridden for eight weeks. Loss of sexual power. Mental hebetude. Memory poor. Bilateral choked disc. Hypotonia of muscles. Slight ataxia of hands. Nystagmus on looking to right. Falls when standing, usually to the left.

Preoperative Diagnosis.—Intracranial process. New Growth. In view of the intense headaches, vomiting and choked discs, a decompression operation is urgently indicated; suboccipital, as the few symptoms point to that region. Bilateral suboccipital exploration. Bone thin. Great pressure. Ventricle punctured through left occipital lobe until dura could be opened without danger of brain prolapse. Folia of cerebellum flattened. Blood pressure fluctuating so that attack of tumor left for a subsequent operation. Dura left open. Four days later, patient died of a post-operative pneumonia. No autopsy.

CASE XXXVI.—(Surgical No. 737.) J. O'N. Complaints of curious attacks, headache, and hemianopsia. Patient had five attacks of great severity in the past year and many slight ones. Three or four minutes before the attacks begin there is a sensation of rushing of blood to the head. In the attack the patient tries to talk, but cannot do so; hears people talking, but without understanding them. In one attack she thought a crowd had gathered about her. Of late has had tingling sensation in the right side of the head. Physical examination: On looking to the extreme right there is a moderate lateral nystagmus in both eyes; the eye-grounds are normal, with interlacing

of the color fields; Wassermann test is negative. Several attacks were observed in the hospital.

Diagnosis.—Temperosphenoidal lesion. In view of the visual phenomena, occipital lobe localization considered, with involvement of Wernicke's field. Operation refused.

CASE XXXVII.—(Surgical No. 738.) L. S., *æt.* eight. Three weeks ago, dimness of vision, especially in the right eye, internal strabismus in both eyes, right corner of the mouth lower than the left, marked staggering of gait in walking. Physical examination shows dilated veins over the entire face, ataxia of the head, cerebellar ataxia in walking, paralysis of the right sixth and seventh nerves, central, Babinski sign on left, spasticity, knee-jerks plus on left, head held to the left, bilateral beginning choked disc. Wassermann test negative.

Preoperative Diagnosis.—Right cerebellar lobe tumor.

Operation.—Suboccipital decompression. No increase of pressure found when the dura was opened; both cerebellar lobes explored and no tumor found. The patient died twenty-four hours later. Autopsy showed an infiltrative glioma, involving the upper portion of the medulla and pons, bulging into the fourth ventricle, merging imperceptibly with white matter; moderate internal hydrocephalus.

CASE XXXVIII.—(Surgical No. 762.) E. T., *æt.* eleven. Struck on the forehead with brick the day before admission; he was unconscious. Physical examination negative, except for local findings on head.

Operation.—Depressed fracture elevated. Uneventful recovery.

CASE XXXIX.—(Surgical No. 461.) M. A., *æt.* eleven. Complaint: Stealing, and depressed fracture. Four years before sustained fracture of skull with depression. No bone removed. Mental change said to have come on since injury. Physical examination negative.

Preoperative Diagnosis.—Tendency to steal and difficulty to manage child. Only evidences of right frontal lobe involvement. As these came on two years after injury, raising depressed fracture seems justified. Under the depressed bone there was thickened scarred dura. This was reflected and cortex found depressed and grey in color instead of the normal appearance. No adhesions. Depressed bone scarified. Dura closed. Patient said to have improved.

GROUP III. MYELITIC PROCESSES.

CASE XL.—(Surgical No. 949.) E. M. S., female, *æt.* thirty-five, married. Myelitic symptoms dating from birth of first child. Marked spasticity of both legs; sensory findings in doubt; no saddle sensory disturbance; weakness in legs; subjective sensation of pain over the abdomen and legs. These symptoms have increased in the last eight years. No bladder or rectal disturbance; no abnormal reflexes.

Diagnosis.—Infectious myelitis, due to birth infection, with a probable resulting serous meningitis, located in the lumbar cord at the eleventh and twelfth dorsal segments. Slow progression of the lesion limited condition to the lower lumbar cord.

Operation.—Exploration planned, but patient did not return.

CASE XLI.—(Surgical No. 952.) H. A., *æt.* forty-eight, married, engineer. February 1st, 1910, the patient was struck in the lumbar region. After the accident he was able to walk with assistance. The lower extremities were weak. Patient remained in bed six weeks. Bladder symptoms did not develop. He began to walk with a cane eleven weeks later, and then returned to his work. His gait has never become normal. About one year ago his condition became worse, chiefly in extreme weakness of his legs. In January, 1913, he fell, striking

his sacral region. He had some difficulty with his rectal control. On June 15th he had to give up work, could walk only a short distance and had violent pains in the knees, legs and feet; this pain was of a shooting character. Spastic gait; hyposthesia of the eleventh and twelfth dorsal segments; knee-jerks plus; ankle-clonus on both legs; Babinski reflex on both legs, and on feet, ankles and extremities; lowering of surface temperature. Gross muscular strength is much below the normal in both flexor and extensor movements, the gait is spastic paretic.

Diagnosis.—Localized traumatic meningitis of the eleventh and twelfth dorsal segments. Tumor not probable. On account of the progressive character of the condition and hypasthetic area, exploration advised.

Operation.—Laminectomy. The cord was found to be hyperemic, with large cholesterin plaques. The meningeal vessels were hyperemic. The cord was incised on the left of the middle line; nothing was found. After incision, there was a marked flattening of the cord. A second incision was made above the first; the dura was closed. Following the operation the patient began to walk better and had very little pain. Hypalgetic around the umbilicus; no other change. The pain below the knee disappeared. The sensory change around the umbilicus is apparently due to the incision of the posterior columns.

CASE XLII.—(Surgical No. 960.) R. J., *æt.* fifty-five. Old operative carcinoma of the uterus. The present complaint is neuritic pain in the legs. The question of diagnosis is between a multiple neuritis and bone metastasis in the spine. No operation advised.

CASE XLIII.—(Surgical No. 981.) Mrs. B. S., *æt.* fifty-six, married. For seven years has had pain in the legs. For the last year could not walk. She was treated for syphilis for six years. At the present time has complete spastic paralysis of both legs, rectal and bladder incontinence, atrophy of leg muscles, incomplete sensory disturbance, as of a lesion of the fifth and sixth dorsal segments. X-ray plate negative. Negative Wassermann reaction. All sensation lost below the sixth dorsal segment, except an area over the left iliac region. Deep pressure sense retained.

Preoperative Diagnosis.—Diffuse process in the sixth and eighth segments, probably an intra-medullary growth, on account of absence of root pain and indefinite limitation of temperature sense.

Operation.—Laminectomy. Removal of extra medullary endothelioma, which had compressed the cord laterally to the size of a millimetre band; tumor the size and shape of an olive. The patient was unimproved following the operation. The bed sores which she had before coming into the hospital showed very little improvement.

CASE XLIV.—(Surgical No. 1,279.) R. G., *æt.* twenty-nine. Inability to walk. Three and a half years ago struck his back on the edge of table. Next three months developed spasticity in left leg and difficulty in walking. This progressed until eighteen months later he became totally paralysed and was anesthetic to all sensations from the waist down. Some improvement, so that on admission patient can move his legs slightly. Neurological examination showed a bilateral ankle clonus, Babinski reflex patella clonus, Oppenheim and Gordon reflexes. Diminished sensation to pin prick from the fifth and sixth dorsal segment down. Also loss of temperature; cotton wool was normal. Wassermann blood and spinal fluid tests negative. Xanthochromia of spinal fluid. Cell count three to four cells.

Preoperative Diagnosis.—Serous meningitis in region of fourth and fifth spinal segment. A fibroma about the size of a pecan lying under the third and fourth dorsal vertebræ was found. Two weeks after the operation the patient showed marked improvement and is now able to walk around the ward.

CASE XLV.—(Surgical No. 1,256.) E. P., *æt.* forty. One month ago was

struck in the back by coal while working in a mine. Immediate paralysis from his waist down. Slight improvement during the first weeks. Retention of urine; rectal incontinence. Atrophy of both legs; K. J. and ankle jerks absent; adduction of the left thigh; slight movement of big toe on left foot; no voluntary movements of the right leg at all. Light touch felt all over the body. Pin prick felt all over the body, but below the twelfth dorsal segment on the right side, second lumbar segment on the left there is change to sensation to pin prick. Exploration advised because of partial improvement as pressure may be causing a physiological block. At the operation marked destruction of cord was found with adhesions binding the roots together. The dura was left open. Patient discharged in three weeks to be taken care of by his doctor.

GROUP IV. PARAPLEGIAS.

POSTERIOR ROOT SECTIONS.

CASE XLVI.—(Surgical No. 97.) G. B., *æt.* forty-one. Traumatic spasticity of the legs of three years' duration; cannot walk without crutches, numbness and pain in the soles of the feet. One year afterwards difficulty in urination. The legs are very spastic, ankle-clonus and Babinski reflex in both legs; difficulty in urination; genitourinary examination negative; examination of the spine entirely negative, and there are no sensory disturbances.

Diagnosis.—Spastic paraplegia, due to traumatic myelitis. Posterior root section as a therapeutic means of relieving spasticity. The cord was found to be normal. The posterior roots were cut at the lumbar enlargement by Taylor's method, used here on account of the region of the cord, which was exposed. The spasticity was markedly less following the operation; the gait was improved.

CASE XLVII.—(Children's Hosp. No. 5,289.) A. G., *æt.* thirteen. Paralysis, difficulty in walking. History negative, except at the age of eleven months; deformity in legs and arms noticed. Right arm spastic, both legs markedly spastic. Back is flexed so that patient cannot stand up.

Operation.—Posterior root section of eighth to twelfth dorsal on the right and eighth to eleventh on the left. Alcohol injection of both obturator nerves; improvement.

CASE XLVIII.—(Children's Hosp. No. 4,031.) J. P., *æt.* three and a half. Healthy baby; normal delivery. When ten months old fell over unconscious and had spasms; since then markedly spastic. Unable to stand or walk; retardation of mental development.

Operation.—Posterior root section second, third, and fifth lumbar nerves cut on each side; improvement. At the end of fourteen months patient could stand alone and is now beginning to walk a little with help.

GROUP V. HYPOPHYSIS GROWTHS.

CASE XLIX.—(Surgical No. 1,009.) A. C. Failing vision for twenty years in the right eye; blindness in the left for three years, with occasional headache. Complete heminopsia, hemichromatopsia temporal side. Central vision retained on the nasal side. Right eye shows slight swelling of the disc; left, completely atrophic disc. X-ray shows a large sella turcica. Negative Wassermann reaction.

Preoperative Diagnosis.—Pituitary tumor.

Operation.—Sella decompression, sublabial route; a great deal of bleeding from what were supposed to be nasal polyps. The floor of the sella completely destroyed by tumor. The patient died six hours afterwards. Autopsy: Tumor proved to be an adenoma, invading both malar bones and growing into the nose.

CASE L.—(Surgical No. 603.) F. R., *æt.* seventeen. Trouble in seeing. At

the age of eight it was noticed that he was blind in the right eye. Nine months ago the left eye began to fail. Three years ago noticed that the left hand was smaller than the right and grew gradually weaker. There was no headache. Neurological examination: Blindness of right eye; connective tissue; proliferation of right disc; primary optic atrophy of left; paralysis of right sixth; paresis of right third; right facial two lower branches show weakness in emotional expression; the left twelfth was involved; atrophy of left hand, with subnormal reflexes; marked abdominal fat; no pubic hair; no hair in axilla or face; genitals infantile in type; high sugar tolerance, 250 g. levulose showed no sugar in the urine; there was subnormal temperature. X-ray showed a deep and large sella turcica.

Diagnosis.—Hypophysis tumor growing from the infundibular portion, involving probably the right optic thalamus, with pressure on the pyramidal tract. Patient refused operation.

CASE LI.—(Surgical No. 635.) P. K., *æt.* thirty-two. Failing vision. Six weeks ago headache. Neurological examination entirely negative; patient very fat; normal sugar tolerance; Wassermann test negative; bilateral hemianopsia. X-ray plate showed large sella turcica.

Diagnosis.—Pituitary tumor.

Operation.—Sella turcica decompression. Right eye improved very definitely following the operation.

CASE LII.—(Surgical No. 673.) A. W., *æt.* sixty-four. Blindness of the right eye; less vision in the left; no headache; progressive blindness six years; right temporal hemianopsia; scanty growth of hair on the body; polyuria producing substance in the urine; extreme thirst. X-ray showed enlarged sella turcica. Wassermann reaction negative.

Preoperative Diagnosis.—Tumor of the pituitary body.

Operation.—Decompression of the sella turcica, portion of the tumor excised. Patient died two days after the operation from respiratory collapse. Autopsy showed large intrapeduncular tumor invading the ophthalmus, chronic pancreatic hypertrophy of the islands of Langerhans, with hyaline degeneration.

CASE LIII.—R. F., *æt.* nineteen. Ten years ago some trouble with his left eye. In past four months almost all vision in right eye has disappeared. Looks twelve years of age. Flat abdomen; female type of pelvis; genitals small. No hair in axilla or pubes. Subnormal temperature. Slight basal field for objects retained in the right eye. Sugar tolerance 75 gr. levulose. X-ray shows moderate sized sella turcica and a bony process extending upward from the sella turcica.

Preoperative Diagnosis.—Tumor of pituitary, probably of pars intermedia. To have glandular therapy and if this dose not help, operation from above.

GROUP VI. MISCELLANEOUS.

CASE LIV.—(Surgical No. 1,133.) A. W., *æt.* fifty-four. Complained of ringing in the ears. Caloric test with large amount of cold water produced no nystagmus. There is a marked right rhythmic tremor of the head. Examination otherwise negative. Meniere's disease. Section of auditory nerve considered, but not advised, as process was beginning in the other ear. Lumbar puncture did not relieve symptoms.

CASE LV.—J. M., *æt.* twenty-nine. Six months ago the patient was hit on the head by falling timber. The chief symptoms are failing memory, inability to work as well as formerly, headache, dizziness, etc. The left pupil is larger than the right, sluggish to light reaction; diminished sensation over the right corneal; left knee-jerk minus; left Achilles absent. Wassermann reaction in the blood and spinal fluid showed 4 plus.

Diagnosis.—Paresis—a question of trauma in paresis.

CASE LVI.—(Surgical No. 1,115.) B. S., *æt.* forty-three. For two years the patient has had constant pain on the left edge of the tongue and lower two-thirds of the face. All the teeth on the left side have been removed. Several alcoholic injections tried, without improvement. An attempt to section the lingual nerve was made some time before case came under observation. The motor element of the tic douloureux is a guttural sound with singultus. Objective sensory findings nil; sinuses were found to be normal. Negative Wassermann reaction.

Operation.—Evulsion of the sensory and motor roots of the fifth by the Cushing-Lexer route. Result, a complete anesthesia on the entire left side of the face, with the exception of the cornea, including the inside of the mouth and tongue.

At no time following the operation was the patient without intense subjective pain in the anesthetic area. The physical condition showed, however, great improvement.

CASE LVII.—(Surgical No. 1,085.) I. R., *æt.* thirty-five. Ulnar nerve was completely severed at previous operation for removal of tumor involving this nerve. There is now a beginning *man en grife*, involving the middle and ring fingers. Sensory examination shows a complete loss of all kinds of sensation within the ulnar territory, protopathic and epicritic completely abolished, deep sensibility maintained.

Operation.—Anastomosis of the ulnar nerve, by turning a longitudinal section of the nerve to bridge over the defect $2\frac{1}{2}$ in. Nerve wrapped up in Cargyle membrane and sutured with fine catgut. At the end of three months a beginning of the return of function, shown by the gradual lessening of the anesthetic area.

CASE LVIII.—(Surgical No. 1,196.) H. G., *æt.* nine months. Spina bifida, ruptured, scar tissue formed, hydrocephalus of extreme grade, child in extremely weak condition. Negative Wassermann reaction. Case unsuitable for operation.

CASE LIX.—(Surgical No. 677.) L. H., *æt.* sixty-five. For sixteen years patient has had spasmodic movement of the neck; the head is turned to the right; the chin rotates to the left; left sternomastoid in constant spasm; much hypertrophy; constant tremor of the head, due to spasm of the posterior rotators of the right side; the movement is continuous, rapid, unaffected by emotion, attention or observation. There is no history of a tic origin. Physical examination entirely negative, especially with reference to an irritative etiological factor.

Preoperative Diagnosis.—Spasmodic torticollis.

Operation.—Section of the posterior primary division of the first, second, third and fourth right cervical nerves, and section of the left spinal accessory sterno-mastoid branch, with excision of a piece of the nerve. Post operative course; marked improvement.

CASE LX.—(Surgical No. 711.) W. H. Struck on the head five days ago while intoxicated; fell to the ground. Complains now of intense headache; there are no other signs of serious intracranial injury. Neurological examination, left Babinski reflex, no other important signs. Spinal fluid showed contamination with blood. Wassermann strongly positive. Improvement after administration of salvarsan. No operation advised.

CASE LXI.—(Children's Hosp.) W. H., *æt.* three months, twenty-one days. Spina bifida very large, 9 by 12 cm., elevated 6 cm. above the skin.

Operation.—Wound per primum. Died three and a half weeks after operation from ileocolitis during the hot weather of August, 1913.

CASE LXII.—(Children's Hosp. No. 5,700.) M. K., *æt.* two months. Spina bifida of moderate size.

Operation.—Discharged cured. Died from ileocolitis during the hot weather several months later.

CASE LXIII.—(Children's Hosp. No. 3,580.) S. B., *æt.* two months. Spina bifida $2\frac{1}{2}$ by 2 in. in his congenital syphilis; healed after operation and doing well; treated for syphilis. Died of measles five weeks after operation.

CASE LXIV.—(Children's Hosp. No. 3,789.) V. N., *æt.* two years, six months, Six months before entrance cut popliteal nerve.

Operation.—Very large defect bridged over by section of a popliteal of the same nerve. No regeneration.

CASE LXV.—R. F., *æt.* twenty-nine. For about two years has had increasing spasticity beginning in the arms and extending to the legs with marked inability to walk and maintain an erect position. This has increased to the extent that she is now almost bed-ridden. Deep superficial reflexes are pathologically increased all over the body. Patella clonus, ankle-clonus, Babinski reflex. Some atrophy in the hands and legs.

Interpretation.—On account of the progression of the spasticity and the fact that multiple sclerosis could be excluded the diagnosis of a limited cervical cord process was carefully considered. Exploration considered as a band of hypæsthesia at the seventh cervical segment could be made out. Wassermann reaction negative. X-ray picture negative; discs normal. Case at the present time shows undoubtedly that the process is amyotrophic.

Diagnosis.—Amyotrophic lateral sclerosis.

CASE LXVI.—(Surg. No. 1,243.) T. N., *æt.* thirty-three. Three and a half years ago fell on the right shoulder, fractured scapula and had a complete paralysis of the right arm from the shoulder down. Total anesthesia to all forms of sensation corresponding to distribution of brachial plexus. Phrenic nerve intact, also posterior thoracic nerve. Plexus explored. So much scar contraction that only one branch of plexus could be anastomosed with distal end of nerve. Prognosis for recovery bad.

CASES LXVII-LXX.—Four alcohol injections. Two of the second division and two of the third division of the trigeminus.

THE CLINICAL IMPORTANCE OF THE DIASTOLIC TEST.*

By FRANCIS ASHLEY FAUGHT, M. D., of Philadelphia.

Until the recent practical demonstration of the accuracy of the auscultatory or auditory method of reading blood-pressure, the reports of the diastolic readings were of little practical value because of their unreliability. They were based upon several methods, none of which had been proved accurate. This fact was generally known, so that few made the diastolic observation routinely, and those who did were not repaid for their trouble, as the figures obtained were so unreliable and uncertain that no logical deduction could be made from them.

The studies of Warfield and others have shown the accuracy of this method, which can be relied upon to give an accurate reading under practically all circumstances, irrespective of the age of the patient, the character of the vessel, or the size of the arm to which the cuff is attached.

In order to analyze the relation of the complete blood-pressure observation to physiological and pathological conditions, it is essential to review the factors controlling blood-pressure. From the clinical standpoint, at least, we may consider the blood-pressure depending mainly upon the contractile power of the heart, which pumps the blood forward, on the one hand, and the calibre of the blood-vessel walls, which offer peripheral resistance to its flow, on the other; and also that peripheral resistance itself depends largely on the tonicity of the walls of the blood-vessels which comprise the general capillary system. Pathologically, we must recognize that changes in blood-pressure are largely due to departures from the normal force of the heart and to alterations in the elasticity and tonicity of the general arterial tree. It will thus be seen that the systolic pressure will approximate closely the actual pressure developed by the heart within the heart itself at the moment of systole, while the minimal or diastolic pressure will be the measurement of the peripheral resistance, which is able to maintain to a varying degree the arterial pressure, while the heart is dilating, plus the factor of elasticity, which also aids in maintaining the continued pressure in the vessel during diastole.

In the pulse-pressure, then, we must have the measurement of the amount of force exerted by the heart in maintaining blood-pressure over and above that normally maintained by peripheral re-

*Read before the Camden City Medical Society, March 30th, 1914.

sistance, *i. e.*, the pulse-pressure gives a figure which roughly measures the pumping capacity of the heart. These facts show clearly the importance of always making a diastolic reading, so that the pulse pressure may be computed.

Under normal conditions there is a definite relationship between systolic and diastolic pressures and probably also between systolic and the pulse-pressure. According to most observers employing methods other than the auscultatory, the relation of the diastolic to systolic pressure is as 3 is to 4 and the pulse-pressure to systolic as 1 is to 4.

Accepting this estimation as usual, Gibson has devised a formula whereby we may be able more or less to estimate accurately the heart work, and in a rough way its output.

My own work is carried out by means of the auscultatory method, which has lately been demonstrated of such value that it has rapidly been adopted for general use. This demands some modification of the formulæ suggested by Gibson. My own observations of the normal relation leads to the following belief. The relation of the diastolic pressure to systolic pressure is about as 2 is to 3 and that of the pulse-pressure to systolic pressure as 1 is to 3. For example, if the systolic pressure is 140, the normal diastolic will be approximately 95 while the pulse-pressure should approximate 45 or 50.

If we bear in mind the fundamental fact that all blood-pressure readings vary normally within certain well-known limits, it will readily be seen that these relations are at best only approximate, which, however, does not materially detract from their clinical value. Actually employed, they have been found to be most valuable guides in separating the normal from the pathological and in estimating the degree of overload in cardiorenal cases.

Following the same reasoning, if the pulse-pressure roughly estimates the systolic output, it follows that this is also an important factor in the velocity of the blood-stream, which for physical reasons must bear a definite relation to the volume output of the heart and to the calibre of the conduits—the arteries—so that, if other factors remain the same, it is not a difficult matter to estimate both the velocity and also the work of the heart while operating under either normal or abnormal conditions.

The above propositions can be arranged graphically as follow.* For example, take a case presenting these figures: S.P. 130, D.P. 85, P.P. 45, P. R. 70; then— $P.P. (45) \times P.R. (70) = \text{Velocity } (3,100)$, and $S.P. (130) \times P.R. (70) = \text{Work } (9,100)$.

We may carry our calculations further and state that the velocity

*These formulæ are only applicable to observations taken with the standard cuff by auscultation; by any other method the relation first suggested by Gibson should be followed.

and the work, as estimated by the above formula, also bear a definite normal relation which is dependent entirely upon the normal relation of pulse-pressure to systolic pressure (which can only be determined by measuring the diastolic pressure).

This velocity-work relation is as 1 is to 3, and is not dependent upon the pulse-rate; for as long as the relation of systolic to diastolic pressures remains normal (they may, of course, be different in every case, without changing their normal relation), the velocity-work ratio will be normal, no matter what the pulse-rate. If we have a more rapid pulse, with unchanged pressure, we undoubtedly increase the total expenditure of heart energy, both for velocity and work; on the other hand, it is possible to conceive of a decreased pulse-rate with a rising general pressure, which would not only allow the velocity-work ratio to remain unchanged, but which need not necessarily add materially to the work of the heart. As a matter of fact, this is precisely what does occur within certain limits under normal conditions. If we accept the foregoing propositions, it will then seem probable that the normal arterial tree will withstand a continual variation in pressure of from 35 to 50 mm. without undergoing pathological change. Then when we encounter a pulse-pressure which is continually more than this, it is evident that the blood-vessels are required to withstand undue stress; and so if we here subtract the normal pulse-pressure from the pathological we have a relative measure of the excess work required of the heart. Now if this difference is multiplied in turn by the pulse-rate per minute, then by 60 and by 24, it is very easy to see the relatively tremendous excess of work and energy required of the heart in every twenty-four hours in order to maintain circulation and nourish the tissues. This would seem to be the true explanation of heart hypertrophy, arterial change and ultimate cardiac dilatation with failing circulation.

Lauder Brunton says: "The diastolic pressure is a factor of great importance, because by its amount and by the difference between it and the systolic pressure we obtain valuable data in regard to the strength of the heart and the condition of the arterioles."

Von Pachon was among the first to express the belief that the normal systolic pressure was not only of uncertain value in the study of many pathological cases, but that its variation within wide limits and at short intervals for any individual, even slight physiological causes, might be actually misleading, as under the following conditions: In decompensated cardiorenal cases where the maximal pressure may be normal, it is only by determining the abnormal elevation of the diastolic pressure and consequent reduction in pulse-pressure that we are able to confirm clinically the circulatory fault.

The minimum pressure represents the true constant load borne by the arterial tree and the resistance which the heart is obliged to

overcome before its contents can be expelled: both data of fundamental importance from the clinical pathological standpoint. It has been found also that the diastolic pressure is a far more constant factor in normal individuals than the systolic, that it is practically the same for all parts of the arterial tree, while the maximal pressure drops progressively from aorta to periphery.

Sheldon* adds the following to our already rapidly increasing information: "The lessened elasticity of the arteries which is found in many conditions contributes to an abnormal relation between the diastolic and systolic pressure, so that in long-continued high blood-pressure, due to lessened elasticity in the artery, there is a failure of the diastolic pressure to maintain its normal relation. The pulse-pressure is increased and we can, by the formulæ already described, estimate the amount of extra work which is demanded by the high pressure incident to arterial rigidity. From these we can draw the following corollary, which is, that increased strain on the heart is to a large degree measured by the amount of diastolic failure, *i. e.*, the larger the pulse-pressure in relation to the diastolic pressure, the greater will be the cardiac strain, which finally fails to respond to the increased demands and enters into a condition of decompensation. So that we may look for signs of poor circulation when there is a high systolic pressure and a diastolic pressure that is relatively low; and conversely, if measures directed toward removing the cause of this abnormal relation are successful, we may measure the amount of improvement by the elevation of diastolic pressure and consequent reduction of pulse-pressure, as is well shown in the case above described."

These two formulæ have been discussed at some length because of their fundamental importance and wide applicability. By means of these, it is a simple matter to compute the excessive work required of the normal heart under varying conditions of strain and load, and also in those pathological conditions of the circulation accompanied by changes in the heart, blood-vessels and kidneys. Anyone who appreciates the value of the blood-pressure test will find these studies of great assistance in diagnosis, prognosis and treatment.

The following case from actual practice shows the method of its employment and the information derived:—

Case of chronic myocarditis and arteriosclerosis.

Before treatment:—

$$\begin{array}{l} \text{S.P. 210, D.P. 100, P.P. 110, P.R. 104.} \\ \left. \begin{array}{l} \text{S.P. (210) } \times \text{ P.R. (104) = Work (21,840)} \\ \text{P.P. (110) } \times \text{ P.R. (104) = Velocity (11,440)} \end{array} \right\} = \text{ratio 1 to 2.} \end{array}$$

**Medical Record*, December 31st, 1910.

After two weeks' treatment:—

S.P. 195, D.P. 140, P.P. 55, P.R. 84.

S.P. (195) \times P.R. (84) = Work (14,580) }
 P.P. (55) \times P.R. (84) = Velocity (4,620) } = ratio 1 to 3.

Here under proper methods of treatment, the work-velocity was greatly benefited, the actual work reduced one-third, so that while the heart was at first only able to maintain the needs of the case under serious strain, and accompanied by evident signs of cardiac distress, after two weeks the danger of acute failure of the circulation was overcome and the whole complexion of the case altered for the better.

It will be seen then that we can roughly estimate the degree of heart embarrassment resulting from arteriosclerosis by means of a determination of the pulse-pressure, and that the pulse-pressure in compensated cases should remain larger than normal in order to maintain the circulation; that an abnormally small pulse-pressure in similar cases would strongly suggest general circulatory failure, due to cardiac dilatation and weakness calling urgently for rest; and finally that an increasing pulse-pressure with such a failing circulation bodes good for the patient, as it is a sign of increasing cardiac tone. The importance of this test, as here applied, is shown by the case cited, in which the systolic pressure varied but slightly, and yet the pulse-pressure was materially reduced. It is even possible to find cases in which the systolic pressure varied not more than would ordinarily be expected from physiological causes, and would therefore indicate nothing, while the diastolic pressure may vary to a wide range and be the true indication of the state of the case from time to time. This test is also applicable to acute conditions to which pneumonia and other infections belong. In these diseases, while it is all important that the systolic pressure should maintain itself at a fair level and be if possible above the pulse in beats per minute, it is more important that the pulse-pressure should maintain a fair ratio in order to supply the needs of the circulation. This is especially applicable to convalescents, such as typhoid patients or those recovering from diphtheria, in which the tendency to heart muscle intoxication seems to be great. You will be guided best in your allowance of exercise in these patients by a repeated complete observation.

I believe from the foregoing remarks, it will be evident to you that we fail to obtain the best from our sphygmomanometer if we omit the diastolic observation, and it is my belief that in many conditions, of the two tests, the diastolic pressure is just as accurately made as the systolic and is often more valuable.

SURGICAL TREATMENT OF PULMONARY TUBERCULOSIS.

By V. P. BLAIR, A. M., M. D., of St. Louis.

Whether situated in a lung, a joint or in any other part, the principles of treatment of a localized tuberculosis are the same: maintenance of nutrition and the production of antibodies, rest of the part, drainage of purulent cavities, and obliteration of resulting defects. In selected instances, to these may be added extirpation of the diseased area or its treatment by direct medication.

Lung tuberculosis presents mechanical problems that are not entirely dissimilar to those encountered in joints. These parts are in constant motion, which tends to spread the disease; and in the lungs, as in the bones, on account of the induration and the rigidity of the chest, cavities are with difficulty obliterated by the drawing in of the surrounding tissue. It is chiefly to these two problems that surgery is applicable in selected cases of lung tuberculosis.

There are six surgical procedures that have been applied to pulmonary tuberculosis: Artificial pneumothorax and rib resection, which two have for their object rest of the part or the obliteration of cavities, counterirritation with the cautery, aspiration and injection of medicated solutions. Pneumonotomy and pneumonectomy have also been resorted to.

Artificial pneumothorax acts on the lung as does a splint on a joint, assuring rest; further, it will at least temporarily allow a lung cavity to collapse.

Samson¹ ascribes the first suggestion of artificial pneumothorax to Carson in 1821, adding that Daus rescued it from obscurity and that Forlanini in 1882 and Murphy later applied it to surgery. Forlanini² made many experiments on animals and human beings, using oxygen, air and finally adopting nitrogen. Since 1890 he has practised it in his clinics and on his private patients, using the puncture method; he invented a safety syringe and has done much to perfect his technique and make the method safe. Saugman added a manometer which measures intratracheal pressure and also indicates by respiratory oscillations the entrance of the needle into the pleural cavity; and he also improved the needle. Murphy³ reported 5 cases in 1898, using the incision method and the injection of large amounts of nitrogen, repeating the latter in two to three weeks. Brauer,⁴ using Murphy's method, makes a free incision, retracts the tissues and examines the pleura which he pierces with a blunt Salomon catheter. This is safest as regards immediate

syncope, but there is danger of infection. In 1906 Spengler and Schmidt also followed Murphy's lead. Dumarest and Dessier use Forlanini's method with good result.

Careful physical and *x*-ray examinations must be made before and during the treatment.

The condition giving best results is advancing stage of unilateral phthisis not yielding to ordinary treatment; but it may prove a special indication in all acute advanced cases while awaiting the 'specific cure.'

A spot free from adhesions is chosen, the needle inserted between the layers of the pleura and the gas injected slowly under slight pressure. Respiratory oscillations in the manometer must insure the entrance of the needle into the cavity before the gas is injected.

The most direct effect is the subsidence of temperature to normal, reduction of expectoration, slowing of pulse, and the disappearance of a tendency to cyanosis and hemoptysis.

The operation must be repeated a number of times at intervals of from four days to two weeks; and it has been stated that as the treatment progresses, though the gas is less quickly absorbed, the beneficial effect becomes less marked. The latter may partly account for the fact that the procedure has not gained more general favor.

The complications are: Massive injections produce dyspnea and collapse; rapid evacuations of contents of cavities may cause infection to spread, emphysema, pleural eclampsia, gas embolism. Forlanini reports 2 cases with embolism; Brauer reports one case of his own and one of another man. There are many cases reported in the English, French, German, Italian and American literature.

Pleural effusion during the treatment suggests pleural infection due to trauma or faulty technique.

Lapham⁵ says there are 600 reported cases with 40 per cent. recoveries.

If the condition does not yield to treatment by artificial pneumothorax a limited resection, under local anesthesia supplemented by external pressure, is the choice of procedure.

The resection of ribs has very much the same object as artificial pneumothorax, the effect being somewhat less marked but more lasting. In addition to collapse of the cavities and rest to the affected lung, Friedrich ascribes part of the good effect to lessened lymphatic absorption. The operation along this line proposed has varied from a simple section of the cartilage of one rib to the excision of all ribs and periosteum on one side, from the second to the tenth. If the periosteum is left in place, according to Friedrich, there is a reformation of ribs around a much smaller thoracic wall. Even in extensive removal of ribs and periosteum there is little

disability of the arm on that side; but, if there are active foci of the opposite side, these are apt to be stimulated.

Friedrich's operation (extrapleural resection of nearly all the ribs, second to tenth inclusive, from their cartilages to the spine including their periosteum), removal of portion of some ribs with their periosteum along the axillary line, resection of parts of ribs with the periosteum directly over the diseased lung, and similar operations without removal of the periosteum and supplemented by external pressure have been recommended.

The operation of this character which has most appealed to us is that practised by Wilms.⁶ It consists in taking out a section of one to three inches of the nine upper ribs or cartilages at the sternal extremity and at the angle. This allows a collapse of the chest wall on the affected side and does away with all expansion. Wilms performs it in one sitting, but we have divided it into three sittings, taking out about six segments at a time through two skin incisions. The only difficult and tedious part is on the first rib. The operation is almost painless when the nerves are properly blocked with 2 per cent. novocain.

In one operation, on a desperately ill patient, we used intravenous ether, an anesthetic we have used a number of times for other purposes, but the patient died shortly afterwards. That none of these operations is free from danger was lately emphasized by the death, during an injection of nitrogen, of a patient in otherwise excellent condition, with a unilateral phthisis, whom we had previously seen in consultation.

The cautery was used by Guerin and Vidal⁸ who reported 37 good results out of 44 cases. Mosler⁹ reports 20 cases improved, no cure.

Koch suggested the injection of disinfectants into the diseased area, but the use has been limited, and injections of iodine and carbolic acid by Hiller, Berlin and others have been unsatisfactory.

Pneumonotomy has been unsatisfactory. Hahn in 1890 reported unsatisfactory results, Cereville¹⁰ reported 6 cases with 5 deaths, Kicke had unsatisfactory results, Truc reported 18 cases with 6 deaths in six months; Poirier and Jonnesco¹¹ had 28 cases, 10 deaths, 15 improved and 4 recoveries; Hofmolke reported 5 cures.

Pneumonectomy, first practised by Ruggi in 1883, would be a surgical triumph if the death-rate were not too large. Friedrich studied the results of this operation on animals, finding that, in addition to the immediate tolerance of the interference, the animals were later in excellent condition. The animals, killed at periods of one to one and a half years after, show the heart partially filling the pulmonary defect and the remaining lung of increased volume. The defect is also compensated by a rising of the diaphragm and a flattening of the chest wall. Kromlein and Lowson resect second,

third and fourth ribs and through this defect amputate the lung with the cautery. Ruggi reported two fatalities in 1885, Kromlein reported two fatalities in 1884, Tuffier, Lowson,¹² and Doyen each report one successful case.

The operation of thoracoplasty for tuberculosis of the lung might be justified under the following circumstances. In simple unilateral tuberculosis it would have to be proved that there is definite good in the use of artificial pneumothorax. If this were proved, then thoracoplasty might be recommended in cases that were otherwise appropriate for pneumothorax but in which lung adhesions precluded its adoption.

We believe that the operation is indicated in certain cases of greatly thickened pleura with old hemo-, hydro- or pyothorax or in which a pyopneumothorax threatens to carry off the patient. It is only in cases of the latter classes that we have used it.

Opinion of writers:—

Ruggi: Phthisis is beyond surgery.

Da Costa: Advises against pneumonectomy.

Jacobson: Recommends pneumonotomy and pneumonectomy only under exceptional circumstances.

Bonchout: Surgical interference is contraindicated.

Biondi: Occasional cases may be saved by operation.

Powell: Little hope unless the cavity is single.

Mosler: Cavities should not be opened until an antiseptic to destroy the bacilli is found.

Berlin: Condemns pneumonectomy.

Decluse: Condemns pneumonectomy.

Hahn: Pulmonary surgery for tuberculosis is unsatisfactory.

Cereville: Pulmonary surgery for tuberculosis is dangerous.

Heydweiller: Pneumonotomy is useless. Conclusions based on 42 cases with 23 deaths.

Richilts: Favors operation; had 60 per cent. recoveries.

Koch: Helpful in cases of localized phthisis which is rare.

Bloch: Favorable in hemorrhage.

Poirier and Jonnesco: Favor operation.

Salomon: Favorable in single cavities.

Murphy: In advanced cases pneumonectomy is inadvisable. Pneumonotomy gives relief if free drainage is secured.

Ewald: Advises operation.

Turban: Advisable in cases of unilateral phthisis.

Tuffier: Favorable if free drainage is secured.

Ferguson: Drainage and injection of iodoform give good results.

Quincke: Pneumonotomy is dangerous.

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MEDICAL AND SURGICAL PROGRESS.

ANTERIOR POLIOMYELITIS.

A REVIEW OF THE RECENT LITERATURE IN REGARD TO THE EPI-
DEMOLOGY, ETIOLOGY, MODES OF TRANSMISSION, BACTERI-
OLOGY AND PATHOLOGY. ITS CLINICAL MANI-
FESTATIONS AND ITS TREATMENT.

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SECTION IV.—TREATMENT.

(CONCLUSION)

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The review of the literature on the treatment of anterior poliomyelitis shows that the medical profession is taking more interest in this side of the subject than ever before. Many new operations have been devised and new techniques developed for tendon and muscle transplantations, silk inserts, arthrodeses, and nerve transferences or grafting. Rather than take up the literature chronologically, it would seem best to group these different methods of treatment into classes so that they could be discussed separately. Muscle training and massage before and after operations is receiving increased attention, but not so much as it deserved. The literature will be covered then in the following order as much as possible.

- (1) Treatment during the acute stage:
Rest; splints; bed treatment; medication.
- (2) Treatment during the subacute stage and convalescence:
Massage; muscle training; apparatus; electricity.
- (3) Treatment during the stage of established paralysis:
 - (a) Apparatus. Deformity.
 - (b) Tendon transplantation and silk inserts.
 - (c) Arthrodesis of joints; nerve grafting.

Gibney and Wallace (2) state that the treatment should be as follows, as soon as the diagnosis is made: Protect the limb or limbs from strain at the joints by means of a trough, either of wood, wire, light steel, or plaster of Paris, well padded with cotton. Keep the feet at right angles with the legs, the knees in slight flexion or very nearly straight, and the thighs on a line with the long axis of the body. They do not advise massage, electricity, or vibration until they feel sure that all inflammatory changes have undergone resolution in the cerebrospinal axis. They believe in preventing strain and deformity of capsules and joints, and keeping the parts in normal positions. They further advocate artificial hyperemia of the parts in the neighborhood of the cord, such as cupping in young children, and the Paquelin cautery in the older ones.

Clark (164) advises free purgation at the outset with calomel or castor oil, complete rest on the back or in the prone position. Toxin elimination should be hastened by hot baths and packs, and ingestion of large quantities of water. The effect of drugs is doubtful, but

belladonna and ergot may be given in full doses, with a view to limiting the paralysis, at least without actual harm.

Diller (147) states that rest is by far the most important element in the treatment of the acute stage. The affected limbs should be placed on pillows, and when there is much tenderness they should be wrapped in cotton. Padded splints and sandbags should be used to keep them in a normal position. Because of the pain and distress caused by the use of electricity, he seldom uses it, believing that massage, gymnastics, and passive movements do as much good in the later stages.

Lovett and Lucas (151) state that the acute stage is represented by an acute hematogenous myelitis. Quiet in bed is essential, and beyond this they question if much is accomplished by the administration of ergot or by blisters, or other counterirritants applied to the back. They believe it is wiser to allow from one to three weeks for the nerve centres to quiet down before using massage and so stimulating their peripheral connections. They state that unless the cord lesion has been extensive, the chances are rather against the total destruction of all the centres and associations of any large number of muscles, some centres and associations having perhaps escaped. It is therefore obvious that in the stage of established paralysis, whether early or late, it is important to prevent unnecessary muscular deterioration, and to utilize so far as possible the unaffected cells in partly affected centres.

They advocate prevention of muscular stretching, muscular disuse, and stimulation to functional activity of muscles partly paralyzed or simply diseased. The absence of function in a muscle or group of muscles does not necessarily mean paralysis, even in the later stages of the affection.

They state that the prevention of muscular disuse and the stimulation of nervous centres in the cord in partially destroyed groups are accomplished by the same means, *i. e.*, massage and electricity. For a muscle to lie idle and not to contract is bad for it, whether it is paralyzed, partially paralyzed, or normal. It will deteriorate locally, and its functional cord centre will not be stimulated to establish new associations or develop any latent power.

Active muscular contraction, or muscle training, is in general the most universally applicable therapeutic measure at our command, and one insufficiently appreciated.

Having worked with massage and electricity for the development of the muscle or muscles, an attempt should be made as soon as possible to get partly affected muscle groups to contract in response to a voluntary impulse.

Starr (3) states that during the acute stage of the disease, cupping of the back by dry cups applied for a short time only, but repeated two or three times a day, may relieve the congestion. Ice bags may have the same effect. As a rule, children in this stage are in great pain and require some sedative; acetanilid, antipyrin, or phenacetin may be given. The fact that urotropin when taken into the system is broken up and releases formaldehyde in the cerebrospinal fluid, has caused Starr to use urotropin where an infection is suspected; giving a child five grains every four hours. After the stage of onset is over, it is wise to give strychnia, which in these cases should be pushed to the point of safety.

The Monthly Bulletin of the Massachusetts State Board of Health

(48) states that it is unfortunately a prevalent idea that recovered power is gained within the first few months of the convalescence, and that after this the child should not be burdened with special efforts directed towards developing individual muscles and nerves, the natural use of the regained muscles being sufficient to establish all the cure which is possible. This idea is particularly unfortunate, for the clinical facts prove the contrary. It is possible to gain a return of muscle power after a long period following the onset of the disease, even when during the interval there had been no evidence of actual local return of power. For such stimulation of nerves and muscles, the means to be employed are electricity, baking and different forms of high heat, physical therapy, including mechanotherapy, hydrotherapy, massage, and muscle training.

Electricity.—The different forms which may be used are galvanic, faradic, static, and high frequency currents. In the early stages, galvanism should be used on the nerve trunks and faradism on the muscles, so long as their irritability for contraction is maintained. When the irritability of contraction to the faradic is lost, galvanism should be used, as having more influence on nutrition. With the returning muscle irritability, faradism should be used, and best by the use of the electrodes over the muscle points, so as to obtain actual contraction of muscles, rather than by the application of the electrical current to broad surfaces. This serves as a distinct exercise to the muscle during its early stage of weak contraction. High frequency and static electricity can both be used for their influence on nutrition rather than for their direct action on muscle contraction.

Baking and application of heat are useful in that paralyzed limbs are almost always cold and the circulation poor. It has been found after the use of baking and the different methods of applying high degrees of heat, that the extremities remain warm for a longer time, that the circulation is more active, and the patient is able to use very weak muscles much better and with better control. It is frequently found that after continued use of these methods the circulation and local heat of the limb become more and more permanent. It is essential that the baking should not be used in too high degrees—not more than 250° F. and continued for not more than twenty minutes.

Muscle Training.—Probably no other means at our disposal has a more important place or more extended usefulness than the different methods which may be grouped under this head. It is applicable as soon as any sign of returning power is found, and is best applied through the 'assistive form' of exercise, which has the advantage of allowing actual work to the muscle long before power is sufficient to give any practical result in movement.

In regard to home nursing, it is stated that the physician should direct his attention to enforcing for a long period, hot air, hot water, or hot sand baths of the paralyzed limbs at frequent intervals, and passive and active movements of the limbs, improvement of the circulation by muscle kneading, and especially muscle training, continued for a long period daily.

Mackenzie (165) states that the ordinary treatment of acute infantile paralysis of the extremities is wrong, and in 18 cases of paralysis of the upper extremities he obtained excellent results in the following manner. The paralyzed muscles were kept absolutely

quiet by braces for possibly a week or even a month after the onset, and in such a position that the muscles could not functionate. With the improvement in the condition, the position and angle of the braces were gradually changed. The patient must be kept in bed during this period. In 10 cases that came under treatment, during the first ten days of the disease he obtained nine cures. A good result is to be expected in cases from three to eight months after four to seven weeks of bed treatment and braces. Five patients were treated by massage, electricity, etc., longer than three months without result. In his experience, he finds that later mechanical and surgical treatment is unnecessary.

Taylor (166) states that the conventional treatment by massage and electricity is completely ineffectual. Improvement occurs only during the stage of spontaneous recovery. He quotes Dr. Bernard Sachs, who stated that "I consider that time given to massage and electricity in these cases is time wasted; I cannot see that such methods do any definite good, and a great deal more benefit would be obtained by early institution of orthopedic measures." Taylor states that this has practically been the unanimous opinion of orthopedic surgeons for a generation. He emphasizes the uselessness of massage and electricity, the value of rest in bed in the early stage, and of orthopedic and surgical treatment, both early and late.

Lange (167) states that we have found that children ill with poliomyelitis and suffering severe pain in the spinal column became free from pain on the application of a plaster jacket, which embraced the entire trunk, exactly like a jacket for spondylitis, and held the spine still and at rest. If it is clinically true that the acute stage of poliomyelitis requires the spinal column to be held rigidly and at rest, then it is clear that more is to be accomplished by careful fixation of the spinal column in an orthopedic jacket or an orthopedic bed than by simply lying in bed; for we must try, when a child is acutely ill with poliomyelitis, to prevent and limit as far as possible the extension of the inflammatory process in the spinal cord. He thinks that at present we can rely less on internal remedies or on hydrotherapeutic measures than on orthopedic fixation of the spinal column.

For a year after the beginning of the illness, the possibility still exists that the paralyzed muscle will recover, and therefore we must do all we can in the first year to assist in this recovery. He warns against rough, hard massage, and above all against deep, firm, stroking massage, on account of its liability to injure the delicate muscle structure of the paralyzed muscle.

Myers (168) states that absolute rest in bed should be continued much longer than is usually done. It is the natural wish of the child and parents to see how much power there is, and continually to test this in various ways, by urging the child to move, to stand, to walk, etc. This is done at great risk of exhausting the weakened muscles. Too much early treatment, such as massage, manipulations and electricity, he believes is bad.

In this article (155) it is stated that if the use of the muscles is greatly impaired, much benefit will be found from placing the patient in a warm bath at a temperature of 100 to 104° F., which must be maintained while the patient is in the bath. The water surrounding the limb on all sides helps to counteract the force of gravity in drawing it out of proper position. The movements when they are

feeble are also more easily accomplished in the warm bath. The treatment by electricity, massage, and systematic exercise, should be continued for from six to eighteen months. When, after the expiration of such a period, the patient has been at a standstill for a month or two, orthopedic measures should be considered.

Feiss (169) states that massage and electricity do no permanent good. Electricity does perhaps hasten the recovery of certain muscles, and more than that, may stimulate some of the good fibres left in the partially paralyzed muscles to carry on the function of the muscles, but it has no specific effect. Neither massage nor electricity can put power into a muscle fibre which is innervated by a nerve which derives its impulses from a cell of origin which is degenerated. The lesion is one of the central nervous system, and the changes in the peripheral and muscular nervous system are secondary only to those changes. Therefore, any recovery which takes place during this stage cannot be due to any treatment which we can institute by any methods which are known to us at present. It is a spontaneous recovery, pure and simple, and the most we can do is to hurry it a bit.

Lovett (171) states that the period of spontaneous improvement in the amount of paralysis follows the subsidence of the fever and the definite establishment of the paralysis. What improvement is going to take place spontaneously will occur in the next few weeks. The best treatment during this period is to let the patient alone, except for preventing deformities and contractures. So long as tenderness lasts, it may be accepted as evidence of the existence of some degree of active myelitis. Under these conditions it seems unphysiological to stimulate by passive movements, massage, or electricity, the peripheral parts connected with these centres. The tenderness may last two to three months after an attack, and a perfectly inactive treatment is hard to pursue when the family has heard of the wonders of massage and electricity. There is no danger that any of the joints will stiffen. When the tenderness has gone, the time for active treatment has begun, and the sooner the patient is on his feet, resuming activity, the better.

Electricity is less highly regarded than was formerly the case. The unintelligent use of electricity month after month, to the exclusion of other measures, has been one of the handicaps which has stood in the way of progress in many cases. Muscle training is the most useful method of treatment. Lovett states that the success of muscle training and other measures has personally been greater in the legs than in the arms.

An editorial (172) calling attention to recent research work on the administration of hexamethylenamin, and the liberation in the body of ammonia and formaldehyde from its decomposition, notes that formaldehyde is found only in acid media, and a true acid reaction occurs only in the urine and the gastric juice; the blood, cerebrospinal fluid, mucus, exudates, etc., are not acid. Therefore no formaldehyde can be liberated in these fluids. This finding has a distinct value in the giving of hexamethylenamin for disinfection of the central nervous system in cases of suspected anteropoliomyelitis. It is evident that it must prove to be of no value.

Berry and Van Deubergh (173) emphasize the necessity of training the weakened muscles so that they will not become atrophied from being constantly stretched and strained by the stronger ones.

It is important not to overtire the patients. Twenty minutes to one-half hour every day or three times a week is considered enough time to spend with any child.

Wright (174) states that the problem of bringing back the maximum of strength to the weakened muscles can only be solved by carefully supervised exercises. She states that better results are to be obtained from the combination of physician and parent than where the management of the exercises has been left to an unskilled gymnast or masseur, who has neither the scientific knowledge of the physician nor the patience and enthusiasm of the parent.

Wright further states that it is possible to do a great deal for cases that have been neglected for years. When there is any ability to contract a muscle, even slightly, by an effort of the will, the muscle cells are more favorably affected by this contraction than by any quickening of the circulation by other means. When not used, the muscle cells degenerate, and the only way to increase oxidation is to make them work. Each time a partially paralyzed muscle contracts, it not only improves the nourishment of its fibres, but also the coordination of the nerves which stimulate it. The amount of improvement possible for any given muscle is, of course, proportionate to the number of uninjured nerve cells which supply it. She states also that it should never be left to the patient to do his exercises alone, even when he is old enough to understand his own case. The response of muscles and nerves is dependent on the strength of the stimulus, and the volition of the patient is greatly aided by the outside stimulus of a word of command. In all exercise periods, the whole attention of the patient should be required, or his ability to use his muscles will be very much underestimated, and the exercises will be much less effective. For this reason, it is desirable that no person, except the one who directs the exercises, should be present. She gives exercises in detail, active and passive, for all groups of muscles.

Frauenthal (175) states that he obtains the best results by beginning treatment when the paralysis appears, and even before the temperature is normal. The first few days, he applies the Oudin or high frequency current along the spine, and he believes that its use hastens recovery on account of its primary effect of contracting the blood-vessels. He believes that its use, also, has a good effect on the inflammation of the cord through its bactericidal qualities. He states that the abuse of massage treatment is in prolonging it. Children who receive an hour or more of treatment daily cannot improve in the face of such a physical tax. Fifteen to twenty minutes is sufficient to administer daily. He calls attention to hydrotherapeutic measures, muscle education, and the use of the galvanic, faradic, sinusoidal, and high frequency electrical currents, and especially to muscle training done before a mirror.

Sachs (176) reports a successful transplantation of the greater pectoral muscle to take the place of the deltoid. This has been done before by Hildebrandt. The pectoralis major was freed from its origin at the ribs, the sternum, and clavicle, with careful preservation of the nerves with their vessels, and was swung around through an angle of 90°, and sewed to the outer end of the clavicle, to the acromion and to the outer part of the spine of the scapula. Good function in the new position was the result.

Lovett and Lucas (151) state that in regard to tendon grafting,

it is important to remove deformity by a preliminary operation, when it is present to any considerable degree, and not to correct the deformity and perform the tendon transfer at one operation. The operation should not be performed on very young children, and periosteal implantation is better than when tendons are united to tendons. Simple operations are better than complicated ones, and in doing an operation, avoid turning corners with the tendon, so as to get as straight a line of pull as possible. The substitution of small muscles for a large one is unsatisfactory; and tendons must be inserted on the stretch, and the foot held over-corrected for some weeks. The after treatment is as important as the operation, and future muscle education is essential to a good result.

Arthrodesis is useful in the ankle, and has been used successfully in the hip. The use of silk ligaments at the ankle is preferable to destruction of the joint in children.

It is stated in this article (48) that the objects of mechanical treatment are (1) to correct deformities; (2) to prevent the development of new deformities; (3) to aid locomotion.

Braces and apparatus for all conditions are described in detail. Arthrodesis of joints is referred to, and it is stated that the operation is one which can be used on the shoulder- and hip-joints. Arthrodesis at the knee-joint leaves the patient with an awkward limb, which for practical purposes is not very serviceable. In calcaneus deformity of the foot, removal of the astragalus is described as "Whitman's operation," and fixation by skin-scar contraction as described by Jones, of Liverpool, is noted. Tendon transfer is taken up in detail but is not suitable for abstraction. Nerve grafting is a method of procedure which may be regarded as still in the experimental stage, and at present does offer much hope of relief. The number of cases, however, to which it is applicable is small.

Myers (168) speaks of the most common deformities following anterior poliomyelitis, and states that they are as follow: At the ankle, equinus or calcaneus, with or without varus or valgus; at the knee, flexion; at the hip, flexion with abduction, from contraction of the tensor vaginae femoris; at the shoulder, the pectoral muscles most often escape and become contracted; at the elbow, no deformity occurs; at the wrist, palmar flexion, adduction of the thumb, and extension of the fingers are also occasionally lost. The most severe and intractable cases of scoliosis are also caused by paralysis.

Surgical interference, where the patient can be watched, should be postponed in nearly all cases two or three years. In order that weakened muscles shall be burdened as little as possible, all braces should be made light.

Lange (167) states that the prevention of contractions makes the application of orthopedic apparatus necessary. But we have all seen how normal muscle may be injured and weakened by the pressure of apparatus; paralyzed muscle is still more sensitive to pressure than the healthy muscle. We must limit therefore the application of orthopedic splints as much as possible. Before operations, redressment of the deformity is always necessary. He is doubtful of the success of nerve plastic operations, and has seen no undoubted successes in cases operated upon. Nerve plastic in a degenerated muscle is always unsuccessful.

In regard to arthrodesis, he states that when by such an operation the patient obtains a greater ability to walk, the operation is

justified. The fixation of the foot greatly facilitates walking on level, smooth ground, but the patients are often very much hindered by the stiffness in walking on uneven, hilly ground. Out of doors and in walking for a long time, the foot, after the arthrodesis, often gives out sooner than before the operation, due to its inability to adapt itself to the irregularities of the surface. Lange describes his silk and tendon transplantation technique in detail, and gives indications for its use. He believes strongly in subperiosteal transplantation silk inserts rather than tendon to tendon transplantations.

Feiss (169) states that two important principles in brace construction are efficiency and simplicity, and he mentions the fact that a brace will seldom correct and hold a deformity at the same time; the deformity must be corrected first, and the brace will then maintain the correction.

Bradford (178) states that the operative measures which have been attempted in paralysis of the shoulder following infantile paralysis have been stiffening of the joint, nerve transplantation of the brachial nerves, the stitching of the trapezius to the deltoid, and transference of a portion of the trapezius with periosteal attachments with silk elongation at the point of deltoid insertion. He believes that the method of periosteal insertion of the transferred bundle of the trapezius, utilizing silk strands quilted in the muscle for insertion into the humerus, is the best method.

He states that he obtained improvement in a number of cases operated upon by this method, but that there were two difficulties which prevented good functional results—namely, the liability of the transferred muscle to be stretched by the weight of the arm, and the difficulty in transferring a large enough portion of the trapezius, and the making of a most effective insertion of the transferred muscle so as to accomplish all the functional power needed. He therefore reinforces a portion of the transferred muscle with silk, thereby forming an artificial interfibrous ligament, which prevents gradual stretching of the muscle. This silk can then be used for a subperiosteal insertion on the humerus in such a way as to prevent sagging of the upper arm and undue dragging on the muscle.

Lovett (171) speaks of the use of apparatus, and states that when the knees flex on account of weakness or paralysis of the quadriceps, a caliper splint should be applied to hold the knees straight. If the feet roll in and out, varus or valgus braces should be applied. If the spine or abdomen is involved, a jacket should be applied. If the standing position induces malposition, such malposition should be corrected, because nothing but harm can come of it. The fear that early use of apparatus will promote muscular atrophy is unreasonable, because nothing is so bad as disuse, and the upright position means more muscular activity. For a growing child to walk about with a malposition is to bid for a permanent deformity.

He states that tendon transplantation, especially when supplemented by silk elongation, is coming into greater usefulness; that arthrodesis of the ankle is of use, but should never be done under twelve years of age, for fear of injuring the epiphysis; and that arthrodesis of the knee-joint should likewise never be attempted in children. At the hip, it may occasionally be used for a dislocated hip, and is at times useful at the shoulder. Silk ligaments at the anterior aspect of the ankle are much to be preferred to arthrodesis

in cases of a flail ankle, because they do not cause a stiff joint, but allow dorsal flexion, while they prevent plantar flexion, or toe drop; they do not cause distortion and may be used in children.

McCurdy (179) speaks of the essentials of successful tendon transplantation as follows: Absolute asepsis; suturing of tendons under a moderate degree of tension; perfect retention in plaster in the corrected position for from six to eight weeks. A thorough knowledge of the anatomy is absolutely necessary before a surgeon may hope to get the best results in tendon transplantation. He states that the operations have been successfully practised in almost every part of the muscular system, and that there appears to be a very wide range for their general application.

Kiliani (180) reports a case of a girl of sixteen who had a flail shoulder as a result of infantile paralysis nine years before. The capsule of the joint was divided horizontally throughout three-fourths of its circumference, and then the upper border of it stitched into the periosteum in such a way as to hold the head of the humerus in its normal position. To secure this position, the long head of the biceps was shortened; the deltoid and trapezius were then freed from the clavicle, and these two muscles were then sutured together. This combined muscle then became a fairly good abductor and added much to the usefulness of the arm.

Strunsky (181) believes that much benefit is derived from the use of electricity, massage, and passive movements. He says that the chief value of these agents is due to their reflex mental action resulting in "the building up of an hypnosis which arouses the mental energy of the patient into a concentrated effort during muscular contraction." He relies largely upon massage, consisting generally of up and down strokes, which he says have little effect upon the muscles themselves, but it is a "fetish which creates enthusiasm" and leads to the building up of the mental and motor brain cells.

Lewis and Davis (182) state that tendons and fascia are not highly differentiated, regenerate rapidly under favorable conditions to repair extensive defects, and require but little blood to maintain functional activity. In their experimental work dogs were used. In one series of experiments, pieces of tendon were removed from the tendo Achillis of one dog and inserted into a defect in the tendo Achillis of another dog. The legs were then immobilized in plaster casts long enough to insure the integrity of the sutures, and then removed. They state that the early use of the leg in a transplant seems to have an important effect on the viability and development of the transplant. In another series, pieces of tendon were removed from the tendo Achillis and inserted into a pocket in the subcutaneous fat of the abdomen. In studying the effects of the fascial transplants, strips of fascia lata or the sheath of the rectus abdominis were dissected loose and buried either under the subcutaneous fat or placed free on the fascial plate from which they had been removed. In the experiments where the tendons had been transplanted, the transplants showed true tendinous regeneration. Pieces of tendon transplanted into the subcutaneous fat became progressively smaller and showed no evidence of proliferative changes. The transplanted pieces formed with the subcutaneous fat close adhesions, but the line between the fat and tendon was sharply drawn. Transplanted pieces of fascia curled up when not sutured in position, and became smaller. At the end of thirty-five days

the fascia was still viable, but considerably reduced in size, and had contracted firm adhesions with the subcutaneous fat, but still preserved the physical characteristics of fascia.

They report a number of cases which had been operated upon successfully by fascia transplants to form tendons, and believe that its success warrants a more extensive use for this purpose, for it has considerable resistance, its elasticity is greater than that of tendons, and its thinness practically guarantees the nutrition of the piece transplanted.

Bartow and Plummer (183) describe the use of intra-articular silk ligament in infantile paralysis, and state that the rationale of the treatment adopted in these cases may briefly be described as follows: "A plan to restrict movement in a joint by means which shall be intra-articular and still preserve motions in the joint." The artificial ligaments are of silk, and are both intra-osseous and intra-articular in location, and are passed through the joint by means of tunnels drilled through the contiguous bone ends in certain directions, drawn tightly and tied, while the leg or foot is in the desired position. The silk ligaments hold the articular surfaces in closer coaptation, and exert a moderate amount of correcting force. In addition to their mechanical action, the silk ligaments themselves become the centres of organizing processes that in time further reinforce the stability of the joint.

The material used is No. 20 Corticelli twisted silk, paraffined, prepared by Lange's method. Its tensile strength is about 125 lb. Operations on the knee, foot and shoulder are described in detail. They state that no tendency has been shown for the silk ligaments to cut their way out of the joint, or to cause sloughing of the tissues in contact with them. They become looser, however, with time and the use of the joint. As they cannot stretch, the chief source of their looseness is probably from bone absorption.

Sever (185) reports certain experiments he carried out on cats for the purpose of showing the repair of tendon, the use of silk inserts, and the methods of tendon regeneration with and without the presence of the peritendineum.

He concludes that tendons lengthened or reinforced with silk are better, in that they are not only stronger, but can be used to greater mechanical advantage. Silk or linen thread are good materials to use. The growth of the new tissue will penetrate and permeate the silk only slightly (in some cases not at all), and does not absorb it.

When the peritendineum and tendon sheath have been removed, some foreign body is essential for regeneration to serve as a director for the new growth. With the sheath and the peritendineum present and sutured, no foreign body need be inserted. In this case, the new growth is true tendon tissue. Without the presence of the sheath and peritendineum, no true tendon tissue can be regenerated. Such tissue is merely fibrous tissue, lacking elasticity and subject to stretching.

The new 'tendons' are apt to be larger and stronger than the resected ones, especially when silk has been used to replace the resected portion. Provided the sheath and peritendineum are preserved, and function allowed early, adhesions may not occur. Without the sheath, adhesions may and do occur much more frequently.

Rich (187) reviews his personal experiences with the use of the

silk ligament. He states that he has used it in 48 selected cases. He believes that when used in the shoulder, its use is satisfactory; but in the lower extremity it is unreliable and impractical. His final results of knee and ankle cases are disappointing and less permanent than given by other methods. The silk ligament is a feasible and useful measure in joints not subjected to the greatest strain, or to external irritation. He believes that its service is most limited in feet that must be encased in shoes, which cause irritation, and necessity of removal. He has had to remove silk in 'successful' cases eighteen out of forty times. He believes that capsule tucking is a better method to use to limit the mobility of paralyzed joints.

Ryerson (188) speaks of the treatment of paralysis of the legs and trunk. He states that the most common deformity following infantile paralysis is the dropping downward of the foot at the ankle-joint, so-called pes equinus. In some cases this is not due to a permanent paralysis of the anterior tibial muscle and toe extensors, but to the fact that in many instances the attending physician takes no measures to hold the foot at a right angle during the first few months after an attack. He states that massage is of value, and galvanic electricity may be of some assistance, whereas faradic electricity is useless. He prefers an open operation when lengthening of the tendo Achillis becomes necessary, rather than a tenotomy, for certain cases have had loss of function because of too great lengthening of the tendon, and have required secondary operative shortening.

He contrasts the Vulpius method of tendon transplantation, where the entire healthy tendon, or a portion of it, is sutured to the tendon or muscle which it is intended to strengthen, and the Lange method, where the tendon which is transplanted is given a periosteal implantation. He prefers the Lange method as giving a better attachment; but in some cases he found that the deformity of the foot had recurred, owing not to the breaking of the silk or the attachment of the tendon, but to the stretching of the periosteum at the point of insertion. He now prefers to place his silk in a hole drilled through the bones of the foot as well as the tibia. He speaks of nerve grafting as having been most disappointing in its results.

In an article on the causes and treatment of paralytic dislocations and subluxations of the hip-joint, Sever (189) reviews the literature of the subject and reports 26 original cases besides 26 other cases from the literature. A summary of the conclusions arrived at through a study of the literature shows that the presence of unopposed contractures at the hip, with and without weight-bearing, is of great importance. The dorsal type of dislocation is the predominant one. The infrapubic or forward dislocation is rare. The prognosis is favorable for a useful leg provided the case is of not too long standing, so that the contractions can be stretched or divided and the dislocation reduced. An arthrodesis of the hip-joint has been found of use in some cases. He reports his cases in detail, with operative procedures, and concludes that subluxations of the hip-joint are not uncommon following paralysis of the thigh and peritrochanteric muscles.

The most important factors in their production are the unopposed contractions of the non-paralyzed muscle. The two muscles which escape the paralysis most frequently are the adductors and

the tensor vaginæ femoris. The most common type of subluxation is upward and backward on to the ilium. The changes from atrophy in the femur and acetabulum are practically constant and consist of a coxa valga and a shallow, flattened and elongated acetabulum. The treatment should be directed towards correcting the contractions and reducing the dislocation of the hip. The muscles may be elongated by stretching, by means of plaster casts, bed traction, or division. The best method of keeping the hip reduced is by means of an arthrodesis, although this is not practical in all cases. Without treatment, the tendency is towards progressive deformity. With treatment the conditions may be permanently helped. Complicating conditions make a total cure impossible, but a more useful leg should be assured under proper treatment. Walking after arthrodesis is often improved, and in some cases splints may be altogether discarded. It is not advisable to do an arthrodesis on both hips, or on any joint other than the hip and ankle on the same leg.

Magruder (190) states that, rickets excepted, infantile paralysis is the most prolific source of deformity. He reports a case where he passed a screw through the external malleolus, astragalus, and calcaneus, and another through the internal malleolus almost at right angles to the first, while a third screw was passed through the scaphoid and cuboid, fixing the key to the arch of the foot. This was done for a flail ankle. The leg and foot were fixed in plaster and after a suitable time the child was taught to walk. He believes that "suits of armour bristling with screws and ratchets," where it is possible to do without them, are a decided disadvantage. He believes that this method of screw joint fixation is an effective substitute for arthrodesis, much less destructive of tissue, quicker in result, and much easier and simpler. Further, it does not permanently destroy the integrity of the joint, or entail the extensive destruction of bone or cartilage, or both, and it does not have to wait for the dictum of the 'tenth year' in order to be effective. Again, these screws can be removed when strength to stand and muscular function are firmly established, thus restoring at least in part the integrity of the ankle-joint.

Davis (191) states that a child should not be condemned to wear a brace unless it is necessary, and it is for this reason that apparatus is no longer prescribed with the freedom that it was a few years ago. He reports a case of severe paralysis of the trunk and left leg in a boy who had been wearing apparatus for seven years. After various operative procedures, including osteotomy of the femoral shaft, transplantation of the biceps femoris, and arthrodesis of the ankle, the leg was greatly improved and braces were discarded.

Allison and Schwab (192), in a paper on muscle group isolation and nerve anastomosis, in the treatment of the paralyses of the extremities, report, besides their cases of spastic paralysis and allied conditions, 3 cases of infantile paralysis operated on for nerve anastomosis. Before the nerve anastomosis, the over-acting or contracted muscles were thrown out of activity by an alcohol injection of the nerve supplying this group. In one case, the anterior crural nerve was anastomosed to the obturator, followed five months later by an improvement in gait. In another case with peroneal paralysis, the musculo-cutaneous nerve, which contained no active fibres, was joined with the normal anterior tibial nerve, followed seven

months later by improvement in the position of the foot, and reaction to galvanic current of the peroneal tendons.

In the third case, an anastomosis was made between the musculo-cutaneous and the normal anterior tibial nerves, followed as in the previous case by an alcohol injection of the anterior tibial nerve below the point of anastomosis to prevent contraction of the muscles supplied by that nerve. Five months later, strong faradism over the site of the external popliteal nerve produced a weak contraction in the peroneal tendons. There was also some ability to evert the foot. This was, however, weak, and was over-pulled by the anterior tibial muscles, as well as by the tibialis posticus.

Osgood (193), in a paper reviewing the evidence in support of the value of nerve grafting in infantile paralysis, makes a careful study of the literature and the technical methods used, and concludes that the number of cases of poliomyelitis, in which the distribution of the paralysis is such as to offer a fair chance of improvement from neuroplastic operations, is probably small. He states that no quick return of power and sensation seems possible in divided and restored nerves. Two and one-half months at least must elapse before any evident return of motion may be expected. From the time of its first appearance, we may expect improvement for fifteen months to two years, depending largely upon the after training and repeated efforts of the patient to send motor impulses down the new path. In regard to the time of operation, he advises that it is better that no neuroplastic operation should be undertaken until all contractures have been overcome, and until overstretched, paralyzed muscles have been placed at rest and allowed to 'take up slack'; and usually not until nine months or a year from the time of the onset of the paralysis. It seems to be fairly certain that we may expect no return of function from nerve suture or implantation when the muscle has been cut off from its supply for a long time, say two years, and fatty degeneration has taken place. He feels that until experimentation has more evidence to offer of the advantage of end-to-end suture, operations on human beings should be confined to implantation of both central and peripheral cut ends of affected nerves into longitudinal slits in healthy nerves. He quotes Taylor, who believes that nerve regeneration is much more active in infants and young children, than in those who have reached adolescence or adult life.

In regard to suture material, when there is to be any tension, fine 0 or 00 silk coated with vaseline or paraffine, after the Lange method, is the most reliable. Where there is to be no tension, fine catgut should be used, with very fine round needles. He concludes by stating that we should bear constantly in mind the maxim of Ambrose Paré, that the first duty of the surgeon is to do no harm.

Feiss (194) states that nerve 'fusion' is a method of crushing the nerve so as to bring about a rearrangement of the normal nerve pattern, which pattern is simply the anatomical arrangement or grouping of the fibres in the cross-section of the nerve, and which bears a definite relation to their peripheral distribution. Authorities state that this pattern can be rearranged under certain conditions, and refer to such a change of pattern as a nerve distortion. By this nerve distortion it is hoped to redistribute fibres which supply a set of muscles or other tissues in such a way as to increase their functional value. Such a change of nerve pattern, or distortion,

cannot be obtained without, temporarily at least, seriously disturbing the nerve tissues at the point where the distortion is desired. Two methods may be used to produce this—nerve anastomosis and nerve fusion.

He calls attention to the histological processes in the regeneration of the nerve scar, where in the last stages the nerve fibres tend to form into their original nerve patterns; and as they pass through the scar they tend to seek out their original tracts in the peripheral stump; and this means that each fibre, whether motor, sensory, vasomotor, pilomotor, or secretory, takes up its original function. Nerve fusion then is nothing more or less than a method which attempts to render permanent the arrangement of the fibres in that stage of regeneration when they run in more than one direction. It is a method of taking advantage of the confused nerve pattern of the scar in the transitory stage of fixing that pattern in the hope that, unless regeneration is finally completed, the fibres will have grown down different tracts from those which they originally occupied. The method consists simply of tying one or more nerves with two catgut ligatures, with the intention of producing a sufficiently long scar to cause distortion of the pattern. In order to be sure that crushing was complete, a hemostat was applied to the nerve between the ligatures, which were placed an eighth to a quarter of an inch apart. In regard to results, his experiments have shown that regeneration has taken place to a marked degree in a number of cases. As regards the comparative value of ordinary nerve anastomosis by suture with nerve fusion, the older method would seem to be much more limited in its applicability. He states also that on account of the immediate degeneration below the scar at the point of crushing or fusion, it does away with the temporary activity of such muscles as may be producing deformity on account of contractions. He reports one case of paralysis of the gastrocnemius, soleus, and tibialis posticus, suggesting a paralysis of the internal popliteal nerve. He fused the external and internal popliteal nerve for a distance of one-half inch, by crushing with a hemostat. Five months later, the child showed considerable improvement in the condition and motions of the foot.

Duroux (195) reviews the history of nerve grafting, and states that the first successful work of this kind was done in France, in 1870; but Albert in 1876 reported the first successful nerve graft in man. He reports a case where he successfully bridged a gap of 15 cm. in the median and ulnar nerves with grafts from the sciatic nerve of a dog, and the sensibility returned to the hand within a month. The motor function was, however, poor. As a rule, grafts from the same species are preferable.

Jones (196) states that arthrodesis properly performed is a valuable means at the disposal of the surgeon, and that failures are generally due to neglect of fundamental principles. The operation should not be performed on children under eight years of age, and never until one is satisfied that the muscles are paralyzed beyond hope. A wedge should never be taken from the tibia, lest the tibial epiphysis be injured. Splints should be worn until union is complete, and until there is evidence that the ankle can bear body weight without yielding.

Macausland and Wood (197) report a number of cases of arthro-

desis of the ankle-joint, where the astragalus has been split longitudinally, and in some cases this split had been filled with bone scrap to keep the halves separated. This splitting was done besides the usual denudation of cartilage and synovia from the joint surfaces to insure a more perfect bony union. They believe that the operation should not be done before twelve or fourteen years of age; and that after these operations many patients do not limp at all, and others only slightly, besides having a perfect functional foot.

Soule (198) states that the object of arthrodesis is to make a more stable and serviceable limb; changing a flail, deformed, or painful joint into a rigid, stable one; thus restoring contour and usefulness. He states that he has found arthrodesis of use in correcting deformities arising from infantile paralysis, hammer toe, flat foot, and wrist-drop. He has done five arthrodesis operations at the astragalo-scaphoid articulation to correct valgus or varus deformity with good results.

In hammer toe, he performs an arthrodesis of the flexed joint, making his incision to one side of the flexor tendons; the success of the arthrodesis being doubly assured by holding the cut bone ends together by making use of the shortened flexor tendon as a splint.

In flat foot, he reports 3 cases in which he did an arthrodesis of the astragalo-scaphoid joint for the cure of painful pronated feet. A rigid foot with a prominent scaphoid, despite correction by stretchings, and plaster of Paris corrections, followed by plates, often remains refractory. By an arthrodesis of the astragalo-scaphoid articulation, a strong bony arch is formed in place of a weakened mediotarsal joint. He also reports 2 cases of arthrodesis of the wrist-joint for a permanent flexion deformity, with good results.

Corner and Bashall (199) have amputated the paralyzed lower extremity in a number of cases of infantile paralysis. Their results have been surprisingly good, both as to subsequent ability to get about on an artificial leg, and in regard to the improvement in their general condition. The amputations to be successful must be as high as the middle of the thigh. In some cases with bilateral paralysis, they have amputated one leg and excised the knee on the other to stiffen the leg. Even under such radical surgical treatment as this, the patients were improved. They draw special attention to the fact that the method is particularly adapted to such patients as will be compelled either to earn their own living or to become public charges later in life.

Schewandin (200) has recently re-examined 5 cases that had been treated by Lexer's technique for paralysis of the ankle, by driving a peg of bone into the joint. The peg was taken from the tibia or fibula of the leg above, with its marrow and periosteum. Besides the 5 cases described in detail, he has records of four other patients, all with an interval of from two to five years since the operation. Good results were obtained only in a few cases. The bone was gradually absorbed, and the condition eventually was no better locally than before the operation. As the bone peg absorbed, the joint grew loose again, and the toes or the whole foot dragged.

Laan (201) declares that too much is expected of tendon transplantation, and arthrodesis is liable to be done too soon; while Lorenz expects too much from massage and forcible manual cor-

rection, and warns against too ready resort to tendon transplantation or arthrodesis.

In the adult cases, the various methods of redressment, of tendon transplantation, or arthrodesis in its various methods can best be employed. Laan is opposed to arthrodesis of the hip and knee. With drop foot, at least one-half the cases work loose again. Even with perfect bony ankylosis, the patient often complains of unevenness of the soles and loss of endurance. He is a strong advocate of silk ligament suspension in cases not indicating arthrodesis.

TISSUE SPECIFICITY.

A REVIEW OF RECENT LITERATURE.

By MOYER S. FLEISHER, M. D., of the Editorial Staff.

1. Rous and Murphy (*Journ. Exper. Med.*, Vol. XV, p. 270, 1912).
2. Murphy (*Journ. Amer. Med. Assoc.*, Vol. LIX, p. 847, 1912).
3. Murphy (*Journ. Exper. Med.*, Vol. XVII, p. 482, 1913).
4. Murphy (*Journ. Exper. Med.*, Vol. XIX, p. 181, 1914).
5. Murphy (*Journ. Amer. Med. Assoc.*, Vol. LXII, p. 199, 1914).
6. Murphy (*Journ. Amer. Med. Assoc.*, Vol. LXII, p. 1459, 1914).
7. Murphy (*Journ. Exper. Med.*, Vol. XIX, p. 513, 1914).

It has long been well known that when tissues of one species are transplanted into the body of an animal of another species, these transplanted tissues are soon destroyed and absorbed; no growth takes place beyond the first few days. This applies to adult tissues; embryonic tissues may grow for a longer period in the body of a host of a foreign species, but even these are relatively soon destroyed.

It has not been clear by what mechanism this immunity to the implantation of foreign tissues is brought about; it has been suggested that the failure of growth of the foreign tissues is due to the lack of some specific food substance, a theory first advanced by Ehrlich only in connection with the implantation of two tumors into animals; the failure of growth of the second tumor he considered as being due to the tumor which was inoculated first absorbing all of this necessary food substance. This theory has been extended by others so as to account for the failure of growth of implanted tissues in foreign hosts. Furthermore, the theory has been held that antibodies are produced against the implanted tissues, and it has been shown that when similar tissues are implanted a second time they are destroyed even more rapidly than they were the first time. Whether these antibodies are to be classed as cytoly-sins or whether some other type of antibody must be called upon to account for this reaction, has never been clear.

Murphy and Rous working with a chicken tumor—a sarcoma—which at first was only transplantable into chickens of the same breed as that from which the tumor was first removed, found that it was possible to implant this tumor into the embryos of ducks and pigeons. Small quantities of the tumor material were injected into the eggs of either pigeons or ducks, so that the material came to lie in or close to the outer membranes of the embryo, and it was found that the tumor grew as well in the embryonic membrane as in the usual susceptible chicken.

Murphy has applied this method to the observation of the growth

of tissues from foreign species. In his first experiments he found that he was able to implant in the chicken egg pieces of rat tumor and that for a certain period of time these tissues grew very well. He used not only rat tumor but also embryonic tissues of the chicken, mouse and rat, various mouse tumors and a sarcoma from a human.

In order to prove that the growth of these tissues in the egg was not due to the carrying over of food substances from the rat, he carried the implantations in the egg through several generations, using the rat tumor removed from one egg to inoculate another series of eggs, and in this manner he was able to carry his material through five generations in the chick embryo. The rat tumor, after growing for several generations in the chick embryo, could again be transplanted into rats, and then grew with all its former vigor.

Murphy determined further whether the tissues which had been grown for some time in chick embryos had become adapted to growth in adult chickens, and he found that quite the reverse was true, as rat tumor, implanted in adult chickens after having grown in the embryos, died even sooner than did tissue taken fresh from a rat and implanted into a chicken. Freshly hatched chickens showed a similar resistance to the growth of rat tumor as did adult chickens, and it was also found that after the eighteenth day of incubation of the egg the graft in the embryo began to die. It, therefore, appeared that the defensive mechanism of the animal against the foreign tissue began to develop about the eighteenth day of incubation and was completely developed by the time the chick emerged from the egg.

Murphy also mentions some facts which might be used as an argument against the theory that the failure to grow in a foreign host is due to a lack of a specific food substance, and that the growth which usually takes place, in the first few days, is due to the carrying over of some of this specific substance. He found that rat tumor remained alive for a longer period of time in mice than it did in chickens. Murphy believes that were the survival and final destruction dependent upon the food substance carried over with the tumor, we should find that the tumor survived for equal periods in both species. On the other hand, the fact that the tumor material, which had been carried through several generations in the chick embryo, was destroyed more rapidly when implanted into adult chickens than material which was implanted directly from a rat, might be brought forward as an argument in favor of the fact that at least the survival in the first few days is dependent upon the carried-over food supply.

It was found that when tissue was implanted at a time when an already implanted tissue would have ceased growing and would be undergoing necrosis, this tissue would not grow in the chick embryo; hence, it was apparent that the failure of growth at this time was not due to the complete utilization of the available food stuff in the chicken egg, but to the development of some immunizing mechanism.

Histologically, it was found that the grafts were invaded by connective-tissue and that the cells were all necrotic; the first appearance of the death of the tissue was manifested in the disappearance of mitoses, which were very numerous in the graft growing in the chick embryo. In the embryo there was no round-celled infiltration to be noted about the dying graft; in the newly hatched

chick there was more round-celled infiltration about the graft than in the embryo and more connective-tissue reaction than in the adult; in the adult the round-celled infiltration was more pronounced than in the newly hatched chick. It does not appear that these histological differences in the three different stages of the same animal exclude the possibility that the mechanism of immunity may be the same in all three, and the probability is strong that the mechanism is the same in the three stages.

In order to determine how to account for the development of the resistance to the growth of the foreign tissue about the eighteenth day of incubation, Murphy attempted to discover whether this was due to the development of any special organ, and tried to supply the organ to the chick embryo by implanting in addition to the tumor graft, grafts of other organs in the embryo. He implanted adult chicken connective-tissue, liver and kidney, and found that none of these organs had any effect upon the growth of the tumor. When, however, spleen or bone-marrow from an adult chicken was implanted at a period previous to the development of the natural immunity, the tumor did not grow, but acted as it would have in an adult animal. It was soon surrounded by small lymphocytes. It was also found that when rat tumor and spleen were grown *in vitro* in the same drop of culture media, the former did not grow.

In the chick embryo the effect of the inoculation of splenic tissue could be noted even if the spleen was implanted some days after the rat tumor had been inoculated, and the spleen could even be inoculated at a site distant from that at which the tumor had been injected. The histological picture was practically the same as that seen in adult chickens when the tissue was being destroyed and replaced by connective-tissue. Splenic tissue was considerably more active than was bone-marrow. It, therefore, seemed probable that the resistance of the chicken to the implantation of tissues from foreign species was dependent upon the activity of the small lymphocytes, and also upon the activity of the spleen and the bone-marrow, the first mentioned more than the second.

In order to test whether the resistance to tissues of foreign species was due to the same factors in other animals as in the chicken, Murphy attempted to destroy the lymphocytes in rats by exposing them to the action of the x -ray for some time; he also used benzol to destroy the lymphocytes, but owing to the toxicity of this substance he was only partly successful. However, in the rats exposed to the action of x -rays he was able to implant tissues from foreign species, and these tissues would grow for quite a number of days, usually up to fourteen or sixteen days; in some cases, however, as long as nineteen days. After this time the tissues began to be replaced by connective-tissue. However, this is longer than the tissues would have survived in the normal animal. He was able to transplant such tissues which had grown in these specially prepared animals through several generations, without having to carry the tissue back to the original species; again we can exclude in this manner the possibility that any necessary food substance was carried over from the normal species host.

It is unquestionable that Murphy by destroying the lymphocytes of the foreign host has made it a better soil for the growth of tissues of foreign species, but it appears that even this procedure

does not make the animal an entirely fit host for the tissue. Murphy has not determined whether the specially prepared foreign host is as good a host for the growth of the tissue as is the normal animal of the same species. It is known that even when tissues are transplanted into animals of the same species that autotransplants (tissue taken from the same animal) grow better than homeotransplants (tissue taken from a different animal of the same species). A comparison must therefore be made between the growth of the tissue in the specially prepared foreign host and the host of the same species from which the tissue was taken.

PROGRESS IN PREVENTIVE MEDICINE IN AMERICA.

A REVIEW OF RECENT LITERATURE.

By R. L. THOMPSON, M. D., of the Editorial Staff.

1. Rosenau: Progress and Problems in Preventive Medicine. (*Vermont Med. Monthly*, January 15th, 1914.)
2. Underwood: The Social Worker's Educational Influence in the Community. (*Boston Med. and Surg. Journ.*, April 30th, 1914.)
3. Norbury: Social Factors in the Prevention of Insanity. (*Lancet-Clinic*, January 10th, 1914.)
4. Nute: Medical Inspection of Immigrants at the Port of Boston. (*Boston Med. and Surg. Journ.*, April 23rd, 1914.)
5. Rucker: Common Sense in Public-Health Administration. (Reprint No. 173 from the Public Health Reports, March 20th, 1914.)
6. Cumming: The Pollution of Tidal Waters. (Reprint No. 181 from the Public Health Reports, April 10th, 1914.)
7. Von Ezdorf: Prevention of Malaria. (Reprint No. 170 from the Public Health Reports, February 27th, 1914.)
8. Deadrick: Schedule for Health Survey. (*Amer. Journ. Tropical Dis. and Preventive Med.*, March, 1914.)
9. Vogt: The Need for a Salaried Medical Profession. (*The Popular Science Monthly*, June, 1914.)
10. Lyon: The Social Status of Medical Practice. (Commencement Address, St. Louis University School of Medicine, June, 1914.)

Lay and medical literature are both so rich nowadays in accounts of progress and in planning campaigns and outlining problems for the prevention of disease that one can only touch here and there, in a review of this sort, some of the spots where an endeavor is being made to better the condition of humanity in this respect.

In a rather extended address, which is worth reading in its entirety, Rosenau calls attention to what he calls the 'sanitary conscience.' He says: "One of the most remarkable developments of this age in which we live is the awakening of a sanitary conscience. It is a new thought in the minds of many a man that the care of the body and cleanliness of surroundings is a very considerable factor in the comfort, safety, and even the life and health of their fellowmen. The sense of moral goodness which comes from a clean and hygienic life is part of the doctrine of sanitary righteousness. Preventive medicine teaches that we must not only safeguard our own bodies against infection, and keep our own surroundings clean for our own sakes, but quite as much for our neighbor's sake. It teaches the lesson of the unselfishness of community interest and

has been a potent biological factor which underlies the present trend towards socialism. One man alone cannot fight the fight against the common foe—infection; it takes the combined and intelligent cooperation of the community.”

The social workers' educational influence in the community is considered in a recent article by Underwood who calls attention to the far-reaching influence of such workers and their value to the community: “One not familiar with the work would hardly appreciate the far-reaching influence of the social worker. Her frequent visits to a home bring her in contact with the well members of the family whom she interests in the condition of the patient, and who thus become educated in methods of prevention of diseases as well as methods of treatment. In her numerous visits to the home she may find another member of the family in a state of malnutrition, anemia, or debility. She sends the person to a clinic or family physician for examination. No definite signs of tuberculosis are found, but with a little treatment to build him up and increase his resistance the patient is rendered less liable to the contraction and development of phthisis. This work the Association believes to be of great value. The work of the social worker, viewed from the economic standpoint rather than the humanitarian, is of great benefit to the state. If it were not for her supervision of patients returned from sanatoria, the large amounts of money expended in sanatorium treatment would in many cases be practically wasted, for it is a recognized fact that unless followed up, many patients would not continue the necessary treatment at home, and were it not for the constant vigilance and supervision of the social worker a recurrence of the disease would be sure to result. Hence, the sum expended in the treatment of the patient at the sanatorium might prove to be a loss to the state, for the patient again may soon return to his former condition.”

While we are apt to think of preventive medicine for the most part in respect to the control of communicable diseases, its scope in reality is much more far-reaching. Norbury takes up the social factor in the prevention of insanity: “The real vital question of the modern conception of disease is its prevention. This question is applicable to mental diseases as well as to the more familiar and more specific diseases which biological and contributory research has placed upon a more scientific and stable footing. We all recognize that the insane will be always with us just as we do that disorder in other forms will be features of civilization so long as man shall live. That change and oblivion awaits the more controllable diseases; that abatement of epidemic diseases, and that new conception of responsibilities in prevention of mental diseases both on the part of our profession and the intelligent laymen, are to be the results of our present-day intensive propaganda of prevention, are within the range of reasonable expectancy. It is through education; through the warfare of sciences against disease as shown in invention, research and discovery, that the perils of physical environment are being lessened. Now, let us through education, through the opportunities of disseminated knowledge, aid in preferential social conditions which will lessen, first, the breeding of the unfit; second, develop social environment which adds to and develops the moralization of mankind, develops his humanitarianism and the recognition of the social rights of others. Surely, as

Baldwin says, it is high time for society, as it becomes conscious of the principles of its own development and of its resources of control, to address itself directly to the problems of eugenics."

Still another angle of this subject is presented by Nute who writes on the inspection of immigrants at the port of Boston. It is interesting to note that the immigrant gets a square deal. "Seldom," says the author, "does the alien suffer from too harsh a judgment." The following defectives are excluded. Class A: Mandatory exclusion because of definite specified diseases such as idiocy, imbecility, feeble-mindedness, insanity, epilepsy, tuberculosis, loathsome or dangerous contagious diseases. Class B: Aliens not under Class A., but present some defect or disease affecting ability to earn a living, as hernia, heart disease, defective nutrition, varicosities, presenility, certain diseases of the nervous system, chronic joint diseases, marked defective vision and tuberculosis of the skin, glands and joints. Class C: Aliens presenting defects or diseases of less seriousness, but must be certified for the information of the immigration officers that they may pass intelligently on the case.

Advancements in our knowledge of the cause of infections has led to many changes in quarantine rules and manner of inspection and disinfection of vessels. For instance, Rucker states that "we should not continue to cling to the practices of yesterday merely because of precedent, but should take stock of ourselves and ask whether the measures which we are now using in our endeavors to control and prevent disease have an actual basis of fact. Formerly, a vessel from a cholera-infected port was subjected to rigid quarantine. The passengers and crew were held during the incubation period. The ship was disinfected from stem to stern and from truck to keelson. The freight was exposed to antiseptic gases which did not penetrate its interior, and it is extremely doubtful if very much was accomplished by these measures toward the prevention of the introduction of cholera. To-day a bacteriological search is made for carriers, and if none is found the vessel is allowed to proceed. Disinfection is not performed unless there is actual reason for so doing, and then with the accuracy of a rifle rather than by the methods of a blunderbuss."

As an 'oyster survey' is now in progress, it is interesting to note the following facts regarding this succulent food product as mentioned by Cumming in an article on the Pollution of Tidal Waters: "The oysters obtain their food by sucking in large quantities of water, from which is strained, in their gills, everything in suspension. Each oyster thus probably passes through itself 10 or 12 gallons of water daily, and Prof. Brooks believed it probable that all the waters of the Susquehanna go through oysters before reaching the ocean. If disease organisms be present they, too, are drawn into the oyster; and while it is probably true that many are digested in its stomach, many are detained in the liquor and remain uninjured in the gills, so that in bacterial study we find many more organisms in the liquor than in the same amount of the water surrounding the oyster. Investigation has shown that not only do disease germs remain alive in the oyster shell after the oyster is removed from the water, but, at least in some cases, they rapidly multiply.

"So long as the taking of oysters was a local affair and communities were small, the purchaser could know the situation and sanitary

condition of the bed whence came his oysters; but with the increase of the polluted area, means for transportation, and widening of the market come loss of identity. Once shipped, the oyster bears no mark by which the consumer can tell the presence or absence of infectious pollution; he must depend upon the shipper or the law for protection.

"Now, the people of the country have been more or less aroused to the modes of conveyance of disease, especially typhoid fever. There has been a great deal written about oysters conveying disease, and already sentiment has abolished this food from many households.

"Undoubtedly many cases of illness have been incorrectly attributed to shellfish infection, undoubtedly many oysters from safe layings have been infected in handling, and undoubtedly many articles written and reports made have been radical, superficial, and have seriously and unjustly injured a great food product; but it is equally true that cases of illness and deaths have been and are being caused by eating oysters from infected beds or from polluted waters, in which they are placed to increase their bulk, and the danger is increasing with the increased amount of sewage in tidal waters near growing communities. The condition is somewhat analogous to the milk industry. Many dealers would without legal compulsion sell pure milk, many through ignorance furnish dangerous milk, and a few will not scruple to sell anything for money. A very large proportion of oysters are a perfectly safe food when bought by the consumer; a larger number are free from infection when taken from their layings. Many planters use intelligence in caring for oysters; some even employ bacteriologists so they may know the sanitary condition of their beds. But there remains a certain proportion of oysters which are taken from polluted beds and others which are plumped into polluted waters. These are dangerous to the lives and health of persons who use them. We have learned or shall learn that we cannot, as a nation or state, now depend upon nature unaided for our food supply, whether it be vegetable, meat, oyster, or fish. Conditions in civilized countries are such that we must encourage and cultivate all of these sources of food if the supply is to be equal to the demand."

While all of us are perfectly familiar in a general sort of way with the important factors concerned in the prevention of malaria, nevertheless certain details on screening might prove of value for the man who wishes to protect his home against the mosquito. The public health report No. 170 by von Ezdorf gives such information and may be obtained for the asking.

A schedule for a health survey is proposed by Deadrick who says that "the most significant evidence of the results of the modern municipal efficiency movement is the widespread consideration of health matters. Public health departments are deservedly being investigated with a view to improvement through constructive criticism. Cities formerly advertising low tax-rates, good railroad facilities and other trade-inducing advantages now call attention to low death and morbidity-rates, child-welfare and other health functions as commercial assets. Popular ignorance of sanitary principles is still one of the most serious impediments to sanitary progress, and publicity is the remedy. The health survey is the gateway to this publicity, and many cities are having sanitary surveys

made. Deadrick has constructed a scheme for such a survey which he believes should prove useful in cities in which an expert is not employed."

While not a new suggestion, one that crops up occasionally is recently touched on by Prof. Vogt: "The state, in the interest of its own preservation and progress, has assumed control of certain activities closely affecting the life of every citizen. Among these are the care of the public roads, the distribution of the mails and the education of the youth. Still other activities now in private control should be supported by the state for the benefit of the whole people. One of the most important of these and the one perhaps receiving most public attention at the present time is the care of the health of the people, a function now delegated largely to physicians, men who receive their reward for community service in the form of fees from private individuals. Under the present system the physician is prosperous in inverse ratio to the health of the community. The doctor is busiest during those seasons when illness prevails most. Were there no disease there would be no need of physicians. This would be an ideal condition for which the people would be glad, not because of hatred of physicians, but because of love for their own welfare. Since the physician to-day receives his reward from the curative side of medical practice he is not professionally interested in the prevention of disease. The public need is for a medical fraternity paid by the public whose interests will be as much in the prevention of disease as in the cure of it. Were physicians paid by the state, they would not fear the loss of income through working for the interests of the well while at the same time attending to the ill, because the lessening of illness would not necessarily interfere with their incomes. Further, the greater their success in the prevention of disease the less the labor that would be required in the cure of it."

In a recent address Dean Lyon of the University of Minnesota Medical School takes up boldly the social status of medical practice and discusses the many defects, and tentatively at least proposes some of the necessary reforms that must in the course of time be seriously considered by all social communities. The fact that Germany and more recently Great Britain have successfully adopted health insurance makes the problem an acute one for America. Dr. Lyon may have sounded the bugle call some years in advance, for our profession is a large and complicated, and therefore of necessity, a slow moving machine. But sooner or later we have got to fall into line and revise the present status of medical practice. Dr. Lyon's ideas will be vigorously attacked from many quarters, therefore they must hold much of good. Leaving out Dr. Lyon's arguments, for every thinking physician should read this address in its entirety, space is afforded here to quote only a few of the aphorisms with which the paper bristles:—

"The right of society to health is one of the latest rights to be recognized.

"We willingly pay to be relieved of individual pain and immediate bodily embarrassments. We have not yet achieved such breadth of vision as to pay to be protected from that which threatens the social body but may not come to us individually.

"First there is the wonderful and far-reaching activity known as Public Health or Preventive Medicine. This movement finds its

scientific foundation in Pasteur's demonstration of the cause of disease and the nature of infection. It finds its mathematical verification in vital statistics. It finds its financial justification in the value of the human animal. But it finds its moral justification in the altruistic concept of race welfare and community happiness.

"Inherent and heedless egotism is the great barrier to progress in preventive medicine.

"The words 'contract practice,' 'company doctor,' 'sickness insurance,' are terms of opprobrium to most of the medical profession; yet the facts and the logic of these facts are simple. You should face them, think them out, adjust your lives to them.'

"Now the medical profession does not object to insurance. Indeed it approves very heartily when the life insurance comes in just at the right time to liquidate the deceased patient's bill. It highly approves of insurance against malpractice and against automobile injuries. But when insurance attempts to provide medical attendance for a group of poor workingmen, the medical profession exclaims in holy horror against the invasion of its ancient prerogatives."

ARTERIAL HYPERTENSION.

A REVIEW OF RECENT LITERATURE.

By ALBERT E. TAUSSIG, M. D., of the Editorial Staff.

1. Dally: Maximum and Minimum Blood-Pressures. (*British Med. Journ.*, October 11th, 1913.)
2. Desgrez and Dorleans: Purin Bodies and Hypertension. (*Compt. rend. Acad. des Sciences*, January 6th, 1913.)
3. Fisher: Hypertension and Nephritis. (*Deutsch. Archiv. fuer klin. Med.*, Vol. CIX, Nos. 5 and 6.)
4. Janeway: Nephritic Hypertension. (*Amer. Journ. Med. Sciences*, No. 5, 1913.)
5. John: Occurrence and Significance of Arterial Hypertension. (*Med. Klin.*, No. 24, 1913.)
6. Josué: Cardio-Arterial Coefficients. (*Paris Méd.*, p. 131, 1913.)
7. Mackinnon: Arterial Pressure in Thoracic Aneurysms. (*British Med. Journ.*, October 4th, 1913.)
8. Mantle: Treatment of Confirmed Cases of High Blood-Pressure. (*British Med. Journ.*, May 3rd, 1913.)
9. Martinet: The Two Hypertensions. (*Presse Méd.*, No. 99, 1912.)
10. Martinet and Heckel: Thirst Treatment of Hypertension. (*Presse Méd.*, No. 28, 1913.)
11. Miller: Clinical Aspects of Hypertension. (*Journ. Amer. Med. Assoc.*, Vol. LXI, No. 14, 1913.)
12. Price: Action of Digitalis on the Blood-Pressure. (*British Med. Journ.*, September 13th, 1913.)
13. Riesman: High Pressure Hypertrophy of Heart. (*Amer. Journ. Med. Sciences*, No. 4, 1913.)
14. Schlayer: Causes of Permanent Hypertension. (*Muench. med. Wochenschr.*, No. 2, 1913.)
15. Stone: Clinical Signs of High and Low Pressures. (*Journ. Amer. Med. Assoc.*, Vol. LXI, No. 14, 1913.)
16. Wallich: Hypertension in Pregnancy. (*Ann. de Gyn. et d'Obstet.*, No. 11, 1913.)

Within the last few years, the question of hypertension has been widely discussed in medical literature and with the nearly universal use of sphygmomanometers by medical practitioners, its recognition and measurement has become general. Nevertheless many false ideas as to its significance and management are still prevalent, and indeed it is only recently that our notions in these matters have begun to clarify. Even the question of its etiology or pathologic physiology is largely undetermined.

Hypertension, being a matter of arterial blood-pressure, has

usually been supposed to be due primarily to arterial changes. In particular, it was supposed to stand in some sort of etiological relationship to arteriosclerosis and this in spite of the universal observation that many cases of extreme hypertension show no evidence of arteriosclerosis and that many patients with hard tortuous arteries have little or no hypertension. The truth of the matter seems to be that the two conditions, while independent of each other, are often due to similar etiological agents, among which may be mentioned syphilis, alcoholism, and the like. These may lead either to arteriosclerosis, hypertension or both, the first if endarteritis is the predominant lesion, the second apparently if the kidneys are primarily affected, both if both tissues are involved.

This view is as yet, however, not universally accepted. On the contrary, a number of eminent clinicians are of the opposite opinion. Thus, Muenzer distinguishes between two forms of arteriosclerosis, one involving the larger vessels, the other the arterioles. The former, he maintains, need not produce hypertension; the latter is characterized by a marked elevation of blood-pressure, an accentuated second aortic sound and hypertrophy of the left ventricle. He considers a permanent hypertension due to arterio-capillary-sclerosis rather than to a nephritis, because severe and long-continued renal disease may fail to produce a high blood-pressure, and, on the other hand, the latter may occur without the coexistence of a marked kidney lesion.

Pal, too, states that the pathological examination of the kidneys in cases of permanent hypertension may show no changes except those due to a passive congestion. He believes, therefore, that the theory which considers all cases of hypertension as due to disease of the renal arterioles is false, and indeed goes so far as to explain most of the albuminurias accompanying hypertension as due merely to circulatory disturbances in the kidneys.

Ophuls has recently published similar anatomical observations. He found, in a large series of cases, that long-continued hypertension may be accompanied by kidneys macroscopically normal or nearly so. He also believes that the importance of renal lesions in hypertension has been overestimated.

Fresh light has been thrown upon this question by the researches of Schlayer and Fischer in Prof. von Romberg's clinic at Tuebingen. They studied carefully the renal condition in 500 cases of hypertension occurring in this clinic within the last six years. Of the patients who had a permanent arterial blood-pressure of over 140 mm. Hg., 62 per cent. showed unmistakable evidence of renal disease. Of the patients who had a permanent pressure of 160 mm. or over, 80 per cent. had an obvious nephritis, while only 3.6 per cent. showed no evidence of renal disease. The results were still more conclusive in the 42 cases that came to autopsy. Of these, 28 cases showed macroscopic evidence of nephritis. In the other 14 cases, the kidneys appeared normal, or nearly so, to the naked eye; a careful examination of these, too, revealed evidence of interstitial nephritis, although in half of these cases only a few scattered areas were found diseased, the rest of the kidney being apparently normal. In not a single case of permanent hypertension that came to autopsy were the kidneys found entirely free from changes characteristic of nephritis, though in several of these cases the urine had always been found normal during life.

Fischer's cases show clearly that a nephritis can by no means be excluded even when the urine is persistently normal. They also speak strongly against the old theory of Traube and Cohnheim that hypertension is due to the mechanical resistance offered to the flow of blood through the diseased kidneys. Obviously, no such resistance can be assumed in a kidney in which all the tissue is normal except in a few small spots. And yet, according to Fischer and Schlager, such cases may show a marked and permanent hypertension.

The attempt has been made to explain hypertension through retention of waste ordinarily eliminated through the kidney. None of the substances, however, which are eliminated by the kidney have a pressor action when injected into animals. On the other hand, when the eliminating power of the kidney is impaired by successive removal of small portions of it, a point is finally reached at which the animal develops a polyuria and increased blood-pressure (Tuffner, Bradford, Passler, Heimicke, Janeway, Carrel). In order to produce these results about two-thirds of the total kidney substance must be removed. It is impossible, however, to say whether these results can be accounted for by lessened elimination or mechanical interference with the renal blood-supply. While in uremia there is usually a nitrogen retention, it has not been shown that such retention is responsible for the increased blood-pressure.

In acute nephritis, especially, there is considerable destruction of kidney substance, and the view has been advanced that perhaps the products of such autolysis might have a pressor effect. Tigerstedt and Bergmann, having reported that a pressor substance could be obtained from the rabbit's kidney, furnished some support for this view. Others, however, have failed to confirm the findings of a pressor substance in the kidney tissue, so that the theory lacks confirmation.

As the adrenals secrete a substance which possesses a decided pressor action, efforts have been made to associate hypertension with increased secretion from this source. Vacquez in 1904 reported hyperplasia of the adrenals in patients with high blood-pressure, but others have failed to confirm these findings. This does not exclude the possibility of hyperfunction of the adrenals, and the various tests developed for the detection of minute quantities of adrenal secretion in the circulating blood have been used in order to determine the presence of hypersecretion in patients with high blood-pressure. The recent investigations of this subject have failed to demonstrate in patients with hypertension an increase of epinephrin in the circulating blood. While there is no proof that the adrenals play a rôle in permanent hypertension, it is quite possible that the fluctuations in pressure due to worry, excitement, etc., may be due to modifications in their secretion, as Cannon and others have shown that the adrenals in a cat become more active under excitement. Time will show which, if any, of the foregoing theories explain permanent high blood-pressure. At present, however, the nature of the process is undetermined.

The above discussion applies only to permanent hypertension. One often observes a temporary elevation of blood-pressure, which may be very considerable, but which has an altogether different significance. The most common occasion for this phenomenon is the neurotic temperament. Such a patient may have a normal blood-pressure after a good night's rest, but may show a marked

hypertension after any mental or physical strain. A similar condition may often be observed in cases of hyperthyroidism, though here the blood-pressure is apt to be more nearly constantly high. The extreme hypertension accompanying an asthmatic attack or a tabetic crisis has the same characteristic of being only temporary and of becoming normal at the close of the seizure. These causes of temporary high blood-pressure lead to a not uncommon source of error when a diagnosis of hypertension is made on the basis of a single observation. This is particularly true of neurotic patients. In them, indeed, the fluctuations may be so rapid and so responsive to psychic changes that when a number of observations are made at a single sitting, no two of them may agree. In general, the first determinations will be too high; later, when the patient has become more used to the pressure of the arm-band, they will approach a more nearly constant lower level. The lowest observation made should be taken as approximating the true value, for diagnostic purposes.

The hypertension of aortic regurgitation, though permanent, also differs essentially from the high blood-pressure of nephritis. In the former, the high pressure is due to the powerful ventricular systole necessary to compensate for the diastolic regurgitation. The duration of the maximal pressure during each pulse is so brief that the pressure must be great in order to provide for an adequate circulation. The expression of this condition is a high maximal and a low minimal pressure, whereas, in nephritic hypertension, both maximal and minimal pressures are high.

The importance of this characteristic of permanent hypertension, that is the high minimal or diastolic pressure, is only beginning to be generally appreciated. Until recently, in recording cases of hypertension, it was customary to state merely the maximal or systolic pressure. It is now recognized that the minimal pressure is, if anything, the more significant of the two. It is much the more constant of the two and, since it occupies the greater portion of each pulse, indicates more accurately the load imposed upon the circulatory system. Many attempts have been made to determine, by means of a comparison of the maximal pressure, minimal pressure and pulse rate, the true condition of the circulation. Josué, the eminent French investigator, lays much stress upon the coefficient obtained by dividing the maximal by the minimal pressure. If $Mx:Mn$ is about 1.5, the circulatory conditions are fairly good. Thus in health with a maximal pressure of 120 mm. and a minimal of 80 mm., $Mx:Mn$ would be 1.5. Similarly if, in a case of nephritis we have maximal and minimal pressures of 250 mm. and 170 mm. respectively, the quotient will be 1.5 and the circulatory conditions, for the time being, good. If the pressures, however, are 200 mm. and 160 mm. (*i. e.*, $Mx:Mn=1.2$), the heart muscle is not overcoming the high peripheral resistance adequately and a break in compensation is threatening. If, on the other hand, $Mx:Mn$ is constantly greater than 1.5 (for instance, maximal pressure 240 mm., minimal 120 mm., making $Mx:Mn=2$), we may infer an over-compensation on the part of the myocardium; the arteries cannot permanently withstand such pulse-blows and become sclerotic. This is the condition which Josué calls *artério-sclérose d'origine cardiaque*. A similar condition obtains in aortic regurgitation, in which, for example, $Mx=220$, $Mn=60$ and $Mx:Mn=3.6$.

Instead of dividing the systolic (maximal) by the diastolic (minimal) pressure, Stone, in a paper read at the Minneapolis meeting of the American Medical Association, suggested using the quotient obtained by dividing the difference between the two pressures (pulse-pressure) by the diastolic pressure. Obviously, this amounts to the same thing as Josué's formula.

Martinet endeavors to distinguish between functional and organic hypertension by comparing the difference between the maximal and minimal pressures, with the diuresis and the viscosity of the blood.

The index to the functional form is obtained by comparing the diuresis with the range between the maximal and minimal pressure; that is, the differential pressure; the index to the organic form is obtained by comparing the viscosity of the blood and the differential pressure. He has found that with normal kidneys the daily output of urine per c.cm. of differential pressure is 0.25 litre or above. With sclerosis of the kidneys, the figure is below 0.20 litre. He gives some diagrams and tables to show the workings of this law and its explanation. A syringe filled with camphorated oil requires more force to empty it than if it were filled with water, and in the same way the viscosity of the blood influences the output of urine. On the other hand, if the syringe is fitted with a finer needle, still greater force is required to empty it even when it is filled with pure water. An organic lesion in the kidneys interferes in the same mechanical way with the output of urine. In a dozen patients with normal or merely functionally high blood-pressure, the differential pressure ranged from 6 to 10 cm. (*i. e.*, 60 to 100 mm.), the viscosity from 4 to 6.2. The index is obtained by dividing the differential pressure by the viscosity. In health or without kidney disease the result is an index ranging from 1.2 to 1.8. In twelve patients with interstitial nephritis the differential pressure ranged from 10 to 22 cm. while the viscosity was low, 3.2 to 4.7 at most, and the index ranged from 2.55 to 7.3. Martinet believes that these calculations serve to throw a valuable light upon the true condition of the circulation.

All these formulæ suffer from the fact that they ignore the mass-movement of the blood, that is the amount of blood thrown into the aorta with each ventricular systole. This factor is difficult or impossible of estimation clinically, and without it such formulæ as the above must always have a restricted value. This restriction applies at present to all blood-pressure determinations, since a perfectly normal maximal and minimal pressure may coexist with a very defective circulation. When properly and cautiously interpreted, however, blood-pressure determinations are of unquestionable value, the diastolic pressure being at least as important as the systolic and a proper interpretation of the findings being based upon an equal consideration of both.

The prognosis in any concrete case of permanent hypertension is difficult, since it depends upon a number of factors, such as the strength of the heart-muscle, the brittleness of cerebral and other visceral arteries, the extent of renal involvement—all difficult of estimation. Obese patients, with moderate hypertension, often do badly, since the transportation of their heavy bulk involves a correspondingly great amount of exertion. An unfavorable prognosis must often be made in hypertension patients unable or unwilling to restrict their mental or physical overexertion, though it is true

that occasionally such patients do surprisingly well. On the other hand, patients with moderate degrees of hypertension (less than 200 mm.), under proper regimen, often have many years of usefulness before them; those with pressures over 200 mm. rarely do so well. In the presence of any considerable degree of hypertension, the first break in cardiac compensation is usually the beginning of the end. The impaired myocardium is far less able to recover its tone in the presence of an undue peripheral resistance than in cases in which the break is due merely to a valvular lesion.

The drug treatment of hypertension is of comparatively little importance and this for two reasons. First, permanent hypertension is fortunately very resistant to the action of drugs, and, secondly, ill results often follow any active depression of the hypertension. Thus the nitrites, while they often fail to affect the hypertension, sometimes lead to a rapid and considerable fall of blood-pressure, usually with undesirable results. The literature is full of such cases, of which one, reported by Thayer, may be cited as an example. The patient, a man, was sent to the hospital with a pressure of 220 and evidences of a slow chronic nephritis. He was given large doses of the nitrites; his pressure fell suddenly to 150 or 160, and he became anuric and comatose. After a week of vigorous treatment he came out of his coma, his pressure rose to about 200 and he left the hospital feeling well. The nitrites may sometimes be given with benefit as an emergency measure, in threatening cerebral hemorrhage or to relieve the pains of angina pectoris, but even here their effect must be carefully watched. As a routine treatment of hypertension, their use is to be deprecated.

The iodides, much vaunted in hypertension, are harmless because ineffectual. Careful pharmacological studies, such as those of Mackinnon, have shown that they have no effect whatever upon blood-pressure. Their utility is possibly due to their analgesic action in aneurysm and angina pectoris and to their specific action where a syphilitic infection is the basis of the hypertension.

The action of digitalis in these cases has been much misunderstood. It is certainly not contraindicated in hypertension and practically never raises the blood-pressure except when the latter is abnormally low on account of a defective action of the heart. Whenever a condition of hypertension is complicated by a break in cardiac compensation, digitalis or one of its allies must be given and may be administered without fear of ill results. All the leading observers in the field of cardiac pathology concur in this view.

Personal hygiene should be the central factor in the treatment of hypertension. A suitable but not excessive amount of mental and physical exertion, the entire avoidance of tobacco and, less essentially, of alcohol, the relief of worry, are all of them important. Adequate bowel evacuations must be enforced; here daily small doses of salines are often useful. A careful regulation of the diet is essential, with due regard to proper individualization. Restriction in the use of meat has long been customary. Desgrez and Dorléans have provided a rational basis for it in showing that the injection of many of the purin bodies constantly raised the blood-pressure. Hecht has shown that a restriction in the intake of meat, liquids, alcohol, salt and spices, in a word an approximately vegetarian regimen leads to a reduction of the high blood-pressure, often to the normal. In extreme cases, as has been shown by Martinet

and Heckel and by John, a rigid restriction in the amount of fluids taken in often leads to promptly beneficial results. The most convenient regimen for this purpose is the Karell diet. The patient is put to bed and for five days given nothing but 800 to 1,000 c.cm. milk daily. The thirst may be relieved by pieces of ice or fruit juices. Then for two days a somewhat more liberal diet is permitted, this to be followed by a second five-day course of restriction. The results are sometimes surprisingly good.

SUMMARY.

1. In all cases of permanent hypertension, a nephritis is probably present. This may be assumed even though the urine is normal, and more certainly if the blood-pressure is high.
2. In the treatment of hypertension, drugs play a minor part. The nitrites are indicated only in emergencies, not as a routine treatment; the iodides are usually useless; digitalis is perfectly safe whenever there is cardiac decompensation.
3. Dietetic and hygienic measures are of primary importance in the treatment of hypertension.

DIAGNOSTIC AND THERAPEUTIC NOTES.

PERTUSSIS.—Feer (*Med. Klin.*, No. 20, 1914). The period of greatest infectivity is during the initial stage. Feer has seen many cases, in the later convulsive stage, that appeared to be entirely non-infectious and very few of whom it could definitely be said that they had spread the contagion. Czerny goes so far as to say: "An infection of other children in bed in the same ward by a child with pertussis, who is also kept in bed, never occurs." Feer explains this observation by pointing out that children with whooping-cough are rarely sent to a hospital until the convulsive stage is well established. When, however, a case develops in hospital the entire ward is usually infected, in spite of the immediate removal of the patient.

Prophylactically, he concludes, it is not necessary to keep a child with a well-developed whoop out of school or away from other children. The patient's brothers and sisters, however, if they show the slightest catarrhal manifestations, should be rigorously isolated.

THE HOME TREATMENT OF SCIATICA.—Pöppelmann (*Aertzl. Sammelbl.*, No. 12, 1914). A pail of boiling water is placed in a tub large enough to permit an old chair to be set in it. A tablespoonful of ol. pini sylvestris is poured into the boiling water, the patient seated on the chair with his feet outside the tub, and two sheets pinned around his neck, so that they reach the floor on all sides, covering him completely but leaving the head free.

In this steam-bath the patient is allowed to remain for twenty minutes. He is then rubbed briskly with a cold wet cloth, dried, and put to bed for an hour. If necessary, especially with elderly people, cold applications may be made to the head during the process of steaming. Internally, iodides are given, preferably iodinevasogen, 7-8 drops three times daily. The bowels must be kept freely open.

The baths are given every other day and five to fifteen sittings are required for a cure. In the writer's hands, a successful outcome has been practically uniform.

A NEW SIGN OF CEREBRAL HEMORRHAGE.—Marie and Léri (*Gaz. des Hôp.*, No. 63, 1914). In 5 cases of cerebral or meningeal hemorrhage, the writers observed a curious greenish fluorescence in the patients' blood serum. This was probably due to the absorption of blood pigment from the extravasated blood. The technique is very simple. A few c.cm. of blood are obtained from a vein and

allowed to clot in a clean test-tube. The clear serum is decanted or withdrawn by means of a pipette and observed in a good light, preferably direct sunlight. The test is positive within a few hours of the apoplectic seizure and persists for several days. It is especially useful in differentiating between cerebral softening and hemorrhages. It may be that the reaction will be found positive in hemorrhagic lesions of other organs. At present it should be utilized in the diagnosis of cerebral hemorrhage only if the other signs point clearly to some intracranial disease.

TREATMENT OF URTICARIA.—Scholz (*Zentralbl. fuer Herz- und Gefässkr.*, No. 12, 1914). Urticaria is now considered to be one of the manifestations of anaphylaxis. The toxic substance causes an excessive stimulation of the vasodilators, resulting in a hyperemia of the cutaneous arterioles with localized edema. The most rational symptomatic treatment would appear to be the administration of some substance able to counteract this vasodilatation by means of stimulation of the vasoconstrictors. The best example of such a substance is adrenalin. In one case of extreme urticaria with insomnia lasting seventy-two hours, edema of the tongue, etc., a single injection of adrenalin was followed by complete disappearance of all symptoms within fifteen minutes. On the following day a relapse occurred, which promptly yielded to a second injection.

The writer states that he has treated a considerable number of cases of urticaria in this manner, always with the same satisfactory results. The treatment is, to be sure, merely a palliative one, since the elimination of the toxic substance itself is not furthered, but the subjective relief obtained is great. A detailed account of the technique and dosage, together with clinical reports, is to appear later, this being merely a preliminary communication.

DIET IN PSORIASIS.—Schamberg (*Dermat. Wochenschr.*, No. 1, 1914). Experiments in metabolism have shown that, when put on an albuminous diet, patients with psoriasis excrete far less nitrogen than normal individuals. The more widespread the eruption the more marked the nitrogen retention. In part, this phenomenon is due to the nature of the eruption itself, as the scabs in psoriasis consist of nearly pure albumin.

As might be expected, a diet poor in nitrogen, influences the eruption favorably. Even severe cases of psoriasis show a nearly complete disappearance of the eruption when put on a vegetarian diet. A return to meat eating is usually followed by a relapse.

NON-OPERATIVE TREATMENT OF OLD PERITONEAL ADHESIONS.—Kroh (*Muench. med. Wochenschr.*, No. 7, 1914). The apparatus used by the writer consists of a large cupping glass attached to a strong laboratory suction pump. The location of the adhesions must first be made out by means of x-rays. The skin over the

abdomen is then thoroughly oiled and the cup applied. The abdominal wall, at the site of application, is drawn into the cup and with it a portion of the bowel. The tension, so exerted upon the adhesions, together with the resulting hyperemia and edema exerts a favorable influence upon the lesion. Adhesions following appendicitis are especially suitable for this treatment.

A SIMPLE METHOD OF PRODUCING HYPEREMIA.—Brill (*Deutsch. med. Wochenschr.*, No. 8, 1910). An intense active local hyperemia is useful in a variety of conditions. A simple method of obtaining it is the following: A cylinder, with a diameter of 4 or 5 in. is made of felt or other non-conducting substance. Into one end an electric extension lamp is sealed in an air-tight manner; the other end is applied to the skin. When the lamp is lit, a marked local hyperemia is produced, with reddening of the skin and great sweating. Burns never occur. The results are quite equal to those obtained with Bier's apparatus.

A SIMPLE TEST FOR UROBILIN.—Hausmann (*Med. Klin.*, No. 7, 1914). The test for urobilin often gives valuable information regarding the condition of the liver. An excessive amount indicates a serious hepatic lesion; total absence means complete occlusion of the common duct.

To 20 c.cm. urine add 2-3 c.cm. of a 10 per cent. solution of copper sulphate and 1-2 c.cm. chloroform. Shake. With a normal amount of urobilin, the chloroform takes on a yellow color; with abnormal amounts a brownish or orange tint.

BOOK REVIEWS.

DEVELOPMENT AND ANATOMY OF THE NASAL ACCESSORY SINUSES IN MAN. Observations Based on Two Hundred and Ninety Lateral Nasal Walls, Showing the Various Stages and Types of Development, of the Accessory Sinus Areas from the Sixtieth Day of Fetal Life to Advanced Maturity. By Warren B. Davis, M. D., Corinna Borden Keen Research Fellow of Jefferson Medical College, etc. etc. Drawings by Dorothy Peters. Philadelphia and London: W. B. Saunders Company. 1914. Price, \$3.50.

As stated by the author in his preface there is an abundant literature "concerning the embryology, later development and adult anatomy of the nasal accessory sinuses." Material has been insufficient, both in this country and in Europe, to establish any uniformity of opinion concerning the development of the sinuses in infancy and childhood. The reason, of course, has been the objection of parents to autopsies on account of the resulting disfigurement. This objection the author has overcome by the development of a special and very ingenious technique. The details of this technique are carefully given in the text. In only one out of 97 cases in which this technique was used was there sufficient deformity to cause any criticism or dissatisfaction.

The illustrations by Miss Dorothy Peters are made from the specimens prepared by the author and are most excellent. Their usefulness is increased by the fact that the points of interest are indicated by labels in the illustrations themselves and not by numbers or letters referring to a text below. This latter method is still in vogue in many otherwise excellent books and should be relegated to oblivion as rapidly as possible. Many of the illustrations, showing the extensive development of the sinuses in infancy and early childhood, must convey something of a shock even to the experienced rhinologist, who has so long held that inflammation of the accessory sinuses in childhood is an exceedingly rare affection. These illustrations will go far in supporting the recent contention of Oppenheimer that accessory sinus inflammation in the early years of life, instead of being rare, is a very common accompaniment of inflammatory processes in the nasal cavities.

Rhinologists and anatomists will find the book of value and great interest.

DISEASES OF WOMEN. Medical and Surgical Gynecology. By Charles A. L. Reed, A. M., F. C. S., M. D., Fellow of the College of Surgeons of America, Professor in the University of Cincinnati, etc. etc. With Four Hundred and Forty-Eight Illustrations in the Text. New York: D. Appleton and Company. 1913.

This new textbook on gynecology betrays a number of features which give it a rather distinct character. The material is grouped into nine sections, each representing an important etiological factor of gynecological diseases: Malformations, Injuries, Displacements, Foreign Bodies, Infections, Neoplasms, etc. An arrangement, such as this, conveys to the student a good conception of the etiology and pathology of gynecological conditions, and gives the author a better opportunity to deal with symptomatology and therapy which as a whole will be found rather similar in the various conditions represented in the same group. Much repetition, otherwise unavoidable, is prevented. The writer has returned to the former type of clear and plain diagrammatic illustration. This seems an advantage, for which but few exceptions the simple line drawing will teach the student more than the most elaborate colored illustration. This simplicity of illustration, however, seems carried too far in the rather few pictures of histological findings (*e. g.*, Fig. 311, Syncytioma). The descriptions of the various operative procedures are unusually good. Appendix B, entitled General Procedure in Abdominal Operations, contains in rather succinct form much valuable advice coming from an experienced operator. On the whole, Dr. Reed has produced an eminently satisfactory volume, apparently well adapted not only for the needs of the student, but full of interest to the physician who is especially interested in gynecology.

INFECTIONS AND IMMUNITIES. By Charles E. Simon, B. A., M. D. An Introduction to the Study of Infection and Immunity, Including Chapters on Vaccine Therapy, Chemotherapy and Serum Diagnosis. For Students and Practitioners. Philadelphia: Lea and Febiger. 1913.

The development of any new branch of science brings in its train a new terminology, and no doubt on account of this the general practitioner feels some hesitancy in approaching a subject which, although of interest to him, has this stumbling-block to a clear understanding. In the book before us the author, in his attempt to introduce the newer ideas on immunity to the uninitiated, uses the technical terms sparingly in the beginning and never, it might be said, in such abundance that confusion follows in the mind of him who is not an adept in this special branch of medicine; hence the general practitioner may acquire a vocabulary as he proceeds to read without any great effort on his part. And it is well that this should be, for in the whole range of medicine there is no subject so interesting, so enthralling, one might say, as immunology, especially if presented, as does Dr. Simon, in a manner that has much to commend it on account of simplicity and conciseness. The first part of the book tells us of the battle between the invaded and invading organisms, a battle in the best sense of the word, for the opposing forces are strong on both sides and the victory is held in the balance for some time. The second part deals with the practical application of the studies of immunity to the treatment and diagnosis of infectious diseases. Approved methods only are given consideration, the intention being to emphasize the number which are involved and to furnish an idea of the general character of the immunology technique. The complicated procedures taking place in the organism during infection and the changes of immunity which combat it are described in the unadorned language which is most unusual in a medical work, but which should be its greatest asset.

PRACTICAL THERAPEUTICS. By Hobart Amory Hare, M. D., B. Sc. A Text-book With Special Reference to the Application of Remedial Measures to Diseases and Their Employment upon a Rational Basis. Fourteenth Edition; enlarged, revised and rewritten. Illustrated with 131 engravings and 8 plates. Philadelphia: Lea and Febiger. 1913.

This book is the fourteenth edition of the author's therapy written in less than twenty-two years, and is one of the best efforts to link the results of *materia medica* and and laboratory investigation with clinical therapy. An attempt has been made to explain, in many instances, that empirical therapy has really had a scientific basis. The fact is recognized that the medical profession still uses many therapeutic procedures which as yet have not been scientifically explained, but which, however, are used in the medical and practical treatment of the sick. Many of these measures are unhesitatingly given in the text, and as to their source, whether from laboratory or outside experiences; all valuable methods of treatment are considered and their use thoroughly demonstrated, not only as to method but as to technique. Besides this phase of the book, the present edition has been thoroughly revised and a great deal of new matter introduced. New chapters have appeared dealing with the use of salvarsan, tuberculin, vaccine therapy, and the newer ideas in regard to cardiac stimulants, relative to their use in such diseases as cardio-sclerosis, Stokes-Adams syndrome, etc. The whole is a text on treatment and *materia medica* which continues to retain its leadership. The plates and engravings are excellent and numerous.

NAHRUNGSMITTELCHEMISCHES TASCHENBUCH. Kurze Anleitung zur Untersuchung und Begutachtung von Nahrungs-, Genussmitteln und Gebrauchsgegenständen. Von Dr. H. Serger, Staatlich approbierter Nahrungsmittel-Chemiker, Vorstand des Laboratoriums der Versuchsstation fuer Konservenindustrie in Braunschweig. Wuerzburg: Verlag von Curt Kabitzsch. 1913. Price, 2.50 m.

So much has been said and written recently on the question of pure food and food adulterations that a rather general interest in the subject has been awakened. While the subject of food analysis belongs to the chemist who is a specialist in such work, the more simple methods can be mastered by those less skilled. It is for the latter class that this little book has been written. Directions for carrying out analyses of the more important food stuffs are given in brief yet ample form, and the book is to be recommended to those possessing some general chemical training who may wish or find it necessary to make investigations of this nature.

THE PATHOGENESIS OF SALVARSAN FATALITIES. By Sanitaets-Rat Dr. Wilhelm Wechselmann, Directing Physician of the Dermatological Department, Rudolph Virchow Hospital in Berlin. Authorized Translation by Clarence Martin, M. D., First Lieut. M. R. C., U. S. Army; Late Clinical Assistant St. Peter's Hospital for Stone and Other Urinary Diseases, etc. etc. St. Louis: The Fleming-Smith Company. 1914.

Wechselmann's contention is as follows: Salvarsan is ordinarily well borne by the organism and in itself is never responsible for fatalities. When properly administered, ill results are always due to some organic insufficiency, usually renal. The chief cause of this renal disturbance is the previous administration of mercury. So far from being less dangerous when following a course of mercury, salvarsan becomes really toxic only under these conditions.

The translation is clear but far from idiomatic, being often merely a word for word translation from the original. The text is full of misprints and the volume shares with the original the fault, unpardonable in a book of this sort, of totally lacking an index.

STERILITY IN THE MALE AND FEMALE AND ITS TREATMENT. By Max Hühner, M. D., Chief, Genito-Urinary Department, Harlem Hospital Dispensary, New York City, etc. etc. New York: Rebman Company. Price, \$2.00.

This volume represents an exact record of most painstaking investigations made by the author concerning the actual cause of an existing sterility, both in the male and female, on a very large number of patients. The work contains much new information in regard to the vitality of spermatozoa, their progress upward as influenced by normal and pathological conditions in the female genital tract, the effect of various douches and vaginal secretions upon them. Among other entirely original suggestions as to the appropriate study of these cases, there is one touching on the investigation of the progress of spermatozoa in the normal and pathological tube. Many errors, heretofore accepted as truths, on account of their repetition in textbooks, are pointed out, and because of these corrections the pages have a special value. The common routine procedure of the present day in the light of this new knowledge must be abandoned, and the more scientific method of dealing with sterility cases, as described in this volume, will have to be adopted.

VICIOUS CIRCLES IN DISEASES. By J. B. Hurry, M. A., M. D. (Cantab.), Ex-President Reading Pathological Society. Second Edition. Philadelphia: P. Blakiston's Son and Co. 1913.

In this volume the author considers the correlated morbid processes which aggravate each other, a continuous disorder thereby being established and perpetuated until correction, if possible, checks the process or breaks the circle and reestablishes the normal activity. The circles are first classified into organic, mechanical, infective, neurotic, chemical, those due to imperfect repair, and artificial; then those dealing with the different systems, respectively, and their more important tracts, such as the nose, eyes, throat, ears, etc.; also pernicious circles associated with the vascular, respiratory and nervous systems as the cause of and leading to extremely moribund conditions with death as the effect. Lastly, the destruction of the circles by art, mechanically and medicinally, when they respond to remedial measures, is considered. While the author admits of numerous shortcomings, the book is nevertheless based upon common sense principles of reasoning, and the logic of its contents is readily appreciated.

HANDBUCH DER PRAKTISCHEN CHIRURGIE. Bearbeitet und Herausgegeben von Geh. Rat Prof. Dr. P. von Bruns in Tuebingen, Geh. Rat Prof. Dr. C. Garré in Bonn und Geh. Rat Prof. Dr. H. Kuettner in Breslau. Vierte umgearbeitete Auflage. II. Band. Chirurgie des Halses und Brust. Mit 293 teils farbigen Abbildungen. Stuttgart: Verlag von Ferdinand Enke. 1913. Price, 27 m.

Volume II of the Bruns-Garré-Kuettner handbook of surgery is of interest chiefly owing to the one hundred pages devoted to the thyroid and thymus glands. As was to be expected, the more recent literature has been carefully considered, and the work of Bircher, Rehn, Klose, Capelle, Biedel, and Erdheim has been incorporated as an integral part of the chapter on thymus and thyroid surgery.

The volume is devoted to the surgery of the neck, and is classified practically along the same lines as have been followed in previous editions.

MASSAGE. Manual Treatment, Remedial Movements, History, Mode of Application, and Effects; Indications and Contra-Indications. By Douglas Graham, M. D., Consultant and Instructor in Massage, Boston, Mass., etc. etc. With a Chapter on Massage of the Eye, by Dr. A. Darier, Paris, Formerly President of the Ophthalmological Society of Paris, etc. etc. Fourth Edition, Revised and Enlarged, with 75 Illustrations. Philadelphia: J. B. Lippincott Company. 1913.

This is probably the best book on massage that has yet appeared. Especially interesting is the history of massage. The practical hints for treating cases are explicitly stated and most valuable; to those desirous of learning massage, this book is full of points of undoubted practicability.

TREATMENT OF CHRONIC LEG ULCERS. A Practical Guide to Its Symptomatology, Diagnosis and Treatment. By Edward Adams, M. D., Instructor of Surgery, New York Post-Graduate Medical School and Hospital, etc. etc. New York: The International Journal of Surgery Co. 1914. Price, \$1.00.

This small brochure of some one hundred pages discusses the pathology and treatment of ulcer of the leg in fairly thorough fashion. Epitheliomatous ulcer of the leg and perforating ulcer of the foot are considered under the head of leg ulcer, as are likewise luetic ulceration, tuberculous ulcers, Bazin's disease, blastomycosis, actinomycosis, and Madura foot. The little volume makes a convenient work for reference and will serve a particularly useful purpose for the general practitioner who is called upon to treat stubborn leg ulcers.

BEITRAEGE ZUR KLINIK DER INFEKTIONSKRANKHEITEN UND ZUR IMMUNITÄTS-FORSCHUNG (Mit Ausschluss der Tuberkulose). Herausgegeben von Dr. L. Brauer, Aerztlicher Direktor des Allgemeinen Krankenhauses Hamburg-Eppendorf. I Band. 3 Heft. Wuerzburg: Verlag von Curt Kabitzsch. 1914. Price, 6 m.

This, the third issue, contains two original articles of importance, one by Lindemann on the bacteriology of criminal abortion and one by Luedke and Koerber on the production of antibodies. Three collective abstracts on corneal ulcer, colicsepsis and the influence of anaphylaxis research upon dermatology and venereology add to the value of the number.

FIBROIDS OF THE UTERUS. Their Pathology, Diagnosis and Treatment. By Sir John Bland-Sutton, Surgeon to the Middlesex Hospital and Its Cancer Charity. With 39 Illustrations. London: Science Reviews, Ltd. 1914.

While this little volume does not contain any new and startling information in regard to fibroids and is just as deficient in the matter of the more advanced treatments, it has one asset that should give us pause—namely, the personal observations of a distinguished surgeon whose keenness of intellect and opportunity for study place him in the front rank of the surgeons of to-day.

DIE BEHANDLUNG DER KNOCHEN- UND GELENKTUBERKULOSE MIT ORTHOPAEDISCHEN MASSNAHMEN. Von Dr. F. Oehlecker, Chirurgischem Sekundaerzte. Mit 69 Abbildungen im Text. Sonderabdruck aus den Tuberkulose-Fortbildungskurs des Allgemeinen Krankenhauses Hamburg-Eppendorf. Band I. Wuerzburg: Curt Kabitzsch. 1913. Price, 3 m.

A short handbook on orthopedic surgery designed for students and general practitioners. It contains nothing new, nor is there any method of treatment advised but the ultra-German. It is not of especial interest to American readers.

BEITRAEGE ZUR KLINIK DER INFEKTIONSKRANKHEITEN UND ZUR IMMUNITÄTS-FORSCHUNG (Mit Ausschluss der Tuberkulose). Herausgegeben von Professor Dr. L. Brauer, aerztlicher Direktor des Allgemeinen Krankenhauses Hamburg-Eppendorf. II. Band. 2 Heft. Wuerzburg: Verlag von Curt Kabitzsch. 1914. Price, 6 m.

The original articles in this number are as follows: Levi: Scarlet Fever in Early Infancy; Aaser: Meningococcus Serum; Detre: Vaccine Treatment; Orlovius: Salvarsan in Childbed Fever.

LE MASSAGE THEORIQUE ET PRATIQUE. La Méthode Indirecte. Par L. Colombani. Paris: Amédée Legrand, Editeur. 1913. Price, 4 fr.

A complete little handbook on massage used in what the author calls the indirect method. It is well illustrated.

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EDITORIAL.

THE GREAT WAR.

The one thing that stands out clearly as a result of the great upheaval which is now going on in Europe to prove the falsity of the brotherhood of men, is the indisputable fact that so far as we are concerned, medically speaking, the advantages are all on our side. We say this because though there may be a number of disputes among our doctors as to which side will win and some friendships will be broken on account of heated argument, the really delightful chapter to record is that at least for a year or so we shall be spared the boredom of listening to some doctor, recently returned from Europe, whose smatterings of foreign knowledge and foreign languages have always been of that exalted type which adds to the gaiety of life in our American cities. The hundreds of medical men, who go abroad every year to get a veneer that passes muster in villages but is of small account in our larger cities, will have to content themselves with reading English, a language that is rich in treasures, so rich that many years are necessary to find even a small part of them. They will also be compelled to visit American clinics at post-graduate schools if they desire further knowledge and experience; and though they will come away with no idea of *der, die, das* and whether Herr Professor von X is a believer in asepsis, they will at least be better Americans, because they will be true to themselves in so far as they will achieve what their citizenship requires of them—a better understanding of their own institutions and of their own language. A sojourn of six months in Germany has never benefited anyone in a medical sense, and in a social has made insufferable cads of material that, had it remained at home, would undoubtedly have improved and been of some comfort and pleasure to others and perhaps an ornament to the medical profession. So let us write in large, fat letters so that even the most nearsighted can see, our intense delight at the thought that our ears for the next twelvemonth or so will not be assailed by ungrammatical German and anecdotes about 'the Professor who was so kind that he turned his whole clinic over to me twice a week.'

We are hearing a deal just at present about our much-to-be-wept-over condition because German preparations are not forthcoming, and what an irreparable loss the absence of these drugs is to the American medical profession. While we appreciate that men who are accustomed to writing prescriptions calling for drugs made in Germany must be in a deplorable state of mind, would it be no solace to them to know that quite a number of books have been written in English on the subject of *materia medica* and that we boast an excellent "Dispensatory"? Of course, to go back to the reading of these books would entail work, but would not the knowledge gained compensate the labor? We think it would; and we also feel that by doing so a few seeds of the right sort of patriotism would be planted in their breasts to prevent in the future that cry of dependence on foreign medical thought and drugs, especially of the German sort, which is now going up in this country.

The dependence of American medicine, of American literature, of American art on Continental ideas has always put us in a ridiculous light with other English-speaking peoples, and in no other country but ours can one see the transplanting of these ideas without the slightest effort to change them to fit the trend of national thought and characteristics. We graft them in the most audacious manner, and especially in medicine do we sin to such a degree that if we had any sense of humor our midribs would be tickled not once a day but many times. Of course, an interdependence of thought throughout the world must obtain, otherwise there would be no progress, but this should never deteriorate, as it has with us in medicine, into a dependence that is almost a vassalage. It was not thus several decades ago, and now that the opportunity presents itself, is this not the moment to break the chain?

We are not writing these lines in bitterness; we are merely calling the attention of medical men to what has resulted from their purblindness. We know just as well as they do in what respect American medicine is lacking, and we know just as well as they and perhaps a little better, that a limited invasion of Continental medical ideas is at present absolutely necessary to further our knowledge. But what they do not know and will not know until they become close students of our literature, be it purely belles-lettres or scientific or medical—and English literature is meant as well as American—is this, that more will be gained from reading books in English than in any other language; for though they may 'plough' through a work in a foreign tongue with a perseverance and endurance that is highly commendable, their gain will not be nearly so great as it should be. Moreover, they will be taught again and again the admirable qualities of their own language: how to express themselves with ease, how to write it in the simplest terms.

P. S.

GOLF AND OUR NERVES.

The subject of athletics has always an interest that is arresting. At times, medical writers concentrate their attention on the child, and after they feel that this unit in our social fabric has received the full benefit of their instruction, the young man or woman comes

in for an ample share of advice. What the results of their tutelage are have never been written large in the history of medicine, but no doubt they make for better physical specimens, and this must surely be reckoned a gain. Of course, as regards what form of exercise should be taken to fit each case, that placid period in conversation or writing, which might be called post-controversial, has not as yet been reached, and for that matter never will, so variegated and diversified is human thought on any subject: a disadvantage, to be sure, to the sore-perplexed individual who cannot understand the disagreements of doctors on so vital a subject as athletics and why one member of the medical profession should be so 'keen' on dumb-bells when another is equally enthusiastic on the efficacy of long walks. But though there have been 'medical talks' without number in our journals on the proper physical training of the young and those about to enter the adolescent stage or in it or slightly beyond, that important entity in our modern civilization—the sedentary, round-shouldered, office-innured, middle-aged, and corpulent or anemic pater whose household burdens and business burdens and faulty metabolism are quite gigantic—has received but scant attention, except from those enthusiasts who knew by some never-explained inspiration that the spinning of tops and occasionally the dancing of the tango would ward off all the physical inconveniences and mental peculiarities so characteristic of the postmeridian of our lives. And on account of this neglect on the part of the medical advisers—a decade ago 'old age' followed much more quickly on the heels of one's fiftieth year than now and treatment thereof was a negligible quantity—the middle-aged man, unassisted, reached out for something to combat his growing corpulency, his ennui, or, in case he imagined his nerves were awry, his disposition to 'fussiness'; and his search was neither long nor difficult, for a bright luminary was sweeping the athletic skies, a luminary that made a strong appeal to him on account of its attractiveness that can be summed up by saying it did not involve violent exercise. The game of golf, directly it became popular, was called the middle-aged man's game, and rightly so, for its votaries were largely recruited from this class; and great was their enthusiasm and quite remarkable were the beneficial results, according to kindly-disposed critics, mostly men who had heretofore lived a life that was completely indoors. The medical world, as well as that other world which is generally thought to be made up of various specimens of the man in the street, rested in content so sure was everybody who had once played this game that at last a haven in the troubled waters of disputed athleticism had been reached. But, lo, another mistake has been added to our many others brought about by hasty judgment; and not only are we fortified in saying this by what has appeared in the *English Review* for July—"Golf and the 'Caddie' Question," by 4 at Walton Heath—but also by a number of articles in recent issues of our medical journals, especially by The Annotator's remarks in *American Medicine* for July.

According to the writer in the *English Review*—and our quotation is by preference from this journal on account of the bold and untrammelled point of view of the writer—"my doctor declares neurasthenia to be the pathological symptom of the game. The vexations, the constant irritations, the disappointments, the con-

centration demanded, the eye strain exacted, the nervous tension involved, the mental stress and 'draw' necessitated by this battle between the imperfections of humanity and the mechanical perfection aimed at, the moral energy dissipated, the artificial *passivity* of temperament which is essential, the sheer egocentricity, egoism, egomania, set up automatically by a game dependent solely upon one's own skill and the retroactive depression caused inevitably by failure at it—these things, my doctor asserts, conduce to a peculiar morbid action upon the nervous system, resulting in a more or less chronic condition of sub-acute melancholia—the idiosyncrasy of the week-end golfer. I have been nearer to an outburst of hysterical weeping on the links than at any other time in life's calvary." Here are words to ponder well, and even granting that the author is too prejudiced against the game to see the benefits which accrue in the same light as would a thoroughly unprejudiced person, we must grant him that degree of sincerity which can come only from close observation coupled with the right sort of judgment.

At the present time when the subjects of the proper care of our nerves and the stringent discipline of our sexual organs are being 'written up' and just as often 'written down' in our medical journals by men whose pens have a facility that is astounding, when the slightest misbehavior on the part of the latter is supposed to wreck the health of the former, when we are advising all sorts of athletics for the various 'slaves' who are chained to their desks on account of the long hours necessitated by our supposedly rampant commercialism, the words which we have quoted from the article by 4 at Walton Heath should sink deep into our consciousness. For if it is true that the game of golf is a nerve-wrecking one, that to drive the young and middle-aged into its dire embrace through misguided advice that has no foothold in the realm of medical science has all along been a huge mistake, it would be well to take the game in hand quite roughly with the thought of purging it of its points which make for neurasthenia, or if that cannot be done, advising those against it who are suffering from 'weak nerves' and an emotionalism that is easily cut loose from its moorings through undue concentration and too much thought of personal achievement. But at least this much can be said with surety, now that we have been made aware of the fact that golf similar to other games can be made the subject of adverse criticism: a new factor has been introduced as a cause of our nervousness or neurasthenia other than the much-advertised sexual organs; and for this we ought to feel grateful to all critics of the game, since we opine that from now on these organs, as a topic of discussion as to their baneful effect on our nerves, will no longer be the Alpha and Omega of papers on why our nerves at the present day are in so deplorable a condition. Separating medical thought for the nonce from a lurid and pessimistic contemplation of our sexual life might be productive of some good in medical literature, especially of the ephemeral sort, for a saner, cleaner point of view will be achieved, even though so popular a game as golf shares in the downfall with other supposedly innocent recreations.

P. S.

ORIGINAL ARTICLES.

DUODENAL CATHETERIZATION AND FEEDING IN INFANTS.

By ALFRED F. HESS, M. D., of New York.

What has proved to be the preliminary work in this field was carried out by means of a soft duodenal tube, modelled after the one devised by Gross for use in the treatment of adults. This tube had a perforated leaden ball at the end (ball-tube), which was carried past the pylorus by means of peristalsis. In the course of repeated tests we found that it was possible to enter the duodenum in infants by means of a simple Nélaton catheter. The catheter, which in this connection may be called an 'infant duodenal catheter,' and which differs from those ordinarily used merely in that it is longer and has the 20, 25, 30, and 40 cm. points measured out on it, can be passed through the pylorus of the infant almost as readily as into the stomach;* the younger the infant the easier its introduction. The fact that the duodenum can be reached in this simple way is probably due to the small size of the stomach and the lack of tonicity of the pylorus in early infancy. The principle of the method is different from that employed in adults, as it is essentially an active and not a passive method, depending upon peristalsis.

It is apparent that direct access to the duodenum must open the door to investigations in various directions: to a study of the pyloric sphincter, to an examination of the pancreatic ferments and of the bile in normal and pathological conditions, to bacteriological studies of the flora of the small intestine in health and in disease. We have considered these subjects in various papers

*Although a serviceable instrument can be prepared in this way by anybody wishing to make use of one, and much of the writer's early work was carried out by means of a catheter which he happened to have on hand, nevertheless a catheter with two eyes at the tip, of exceptional length, and carefully marked has additional advantages. The use of a bulb instead of an ordinary aspirating syringe has decided advantages, the greatest is that in aspirating through a bulb by means of the mouth one can appreciate the amount of resistance offered by the stomach, or intestine, and thus gain valuable information as to the whereabouts of the end of the catheter. The writer would by all means urge anyone who intends to use this method frequently to employ an aspirating bulb. The bulbs and the infant-duodenal-catheters may be obtained of Tiemann and Co., New York.

from time to time during the past few years. In this article, however, duodenal catheterization will be discussed only in relation to pyloric obstruction and its treatment. It seems hardly necessary to describe the technique of passing the catheter, as this information may be found fully detailed elsewhere.* We may add, however, that it is not more difficult than most medical examinations, for

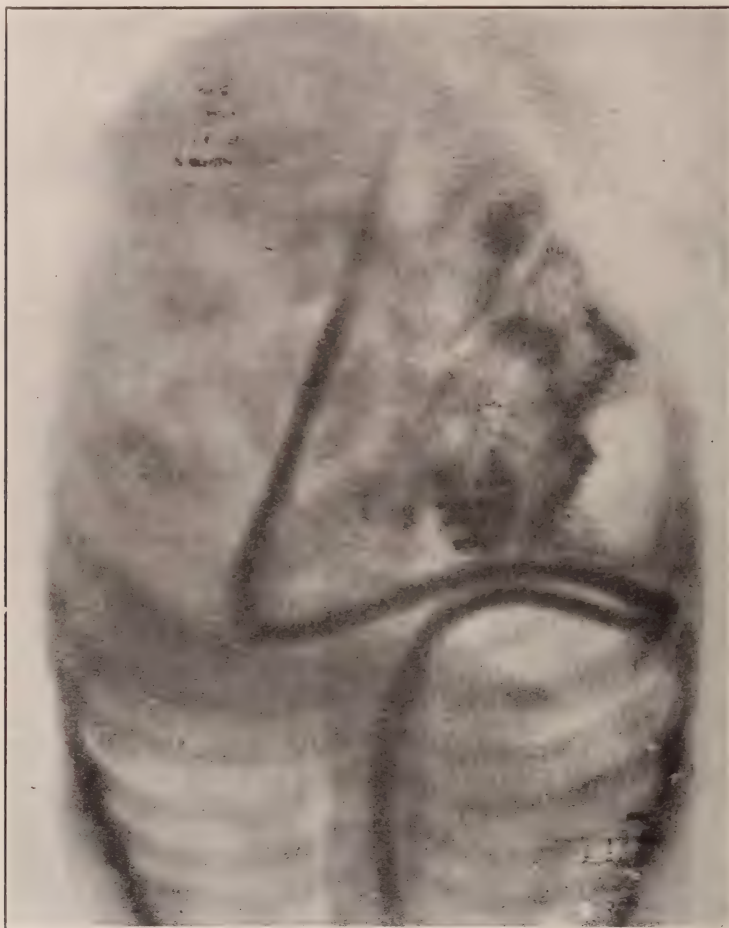


Fig. 1.—Duodenal feeding. Stomach empty; catheter in duodenum; food in coils of intestine. Note the typical bend towards the fundus of the stomach.

example, an otological inspection. In neither examination should one attempt to employ a method for the first time on an abnormal case—the technique should be learned on the normal infant. This warning seems to be timely in regard to duodenal catheterization. If a fluoroscope is at hand, its aid should be welcomed to determine

*Hess: The Use of a Simple Duodenal Catheter in the Diagnosis and Treatment of Certain Cases of Vomiting in Infants. (*Amer. Journ. Dis. Child.*, No. 3, p. 133, 1912.)

whether the catheter has traversed the pylorus, but after some experience this control is rarely necessary. The most reliable evidence that the catheter is in the duodenum is the aspiration of bile, of neutral or alkaline reaction. The accompanying illustration shows the catheter within the duodenum (it is not necessary to introduce bismuth or any other opaque substance into the catheter to have it cast a deep shadow) and bismuth-milk within the coils of the intestine. One of the most striking features of this radiograph is the sharp bend to the left, toward the fundus, which the catheter makes upon entering the gastric cavity. This 'fundic flexure' is almost invariably the rule. It is probably brought about by the inclination toward the left of the lower end of the esophagus and the cardiac portion of the stomach, and serves to bring all solid food into contact with the fundus, the seat of the digestive glands.

THE CATHETER IN DIAGNOSIS.

Let us consider the subject of diagnosis. There is perhaps no group of cases more puzzling at times than that characterized by persistent vomiting. From day to day our diagnosis wavers among various possibilities—chronic indigestion, pyloric spasm, beginning pyloric stenosis and other less common and even less well-defined conditions thrust themselves forward in turn for consideration. For although the diagnosis in the classical case is simple, in many others we grope for weeks, and even when all is over we do not feel confident that we have solved the nature of the disturbance. In cases of this description the duodenal catheter has been of assistance. As an instance we shall cite one of our earliest cases, as it demonstrates the use of the ball-tube and illustrates the presence of cardiospasm which, in our experience, is so frequently combined with pylorospasm in infants:—

CASE I.—A. W., aged 2 months, weight 5¾ lb., a premature baby, with a history of vomiting for some weeks. After admission the infant regurgitated almost all feedings; temperature was subnormal, stools yellow. Food consisted of a milk-mixture containing approximately 1 per cent. fat, 6 per cent. sugar, 1 per cent. protein, of which 3 oz. were given every three hours.

May 13th, 1911, 4 p. m. Catheter passed and stomach emptied of about ½ oz. watery fluid. Some difficulty in passing into stomach. Duodenum could not be entered. The duodenal ball-tube (6 mm. ball) was also tried without success. Both were held at the 20 cm. mark.

At 4:25 p. m. an attempt was made to allow the tube to find its way through the pylorus by the slow method, by peristalsis. The cardia, and more especially the pylorus, seemed irritable, the baby crying when the tube was pushed beyond 20 cm. mark. Five c.cm. of markedly acid juice were obtained. At 5:30 p. m. water was put into the stomach to aid in instrumentation, but of no avail; held always at 20 cm. mark. At 5:35 p. m. the tube was removed.

Epicrisis:—A case of spasm or stenosis of the pylorus, combined with spasm of the cardia. Nothing was known of the history of vomiting of this case when the catheter was passed, as the infant was selected for the purpose of

obtaining duodenal juice for chemical examination. It was only after our unexpected failure to pass the pylorus that we inquired the anamnesis, and learned to our great interest of the persistent vomiting. We then put 4 oz. of fluid into the stomach by lavage, but no marked gastric peristalsis was noted; 1 oz. of the fluid was forcibly ejected.

May 16th, Test 2:—Baby still regurgitated; food the same; fed two hours ago; temperature subnormal; stool yellow.

3:30 p. m., 6 mm. ball-tube passed; obstruction at 15 cm., which was overcome; marked acidity of food in stomach; ball again held at about 21 cm. mark, even though water was put into stomach (accessory method).

4:05 p. m., tube withdrawn, some obstruction at cardia.

4:10 p. m., 16 French catheter passed, slight obstruction at 15 cm.; marked obstruction at pylorus.

4:35 p. m., marked gastric secretion; ball-tube again tried, after dipping it into cod-liver oil and pouring small amount of oil into stomach. Failure.

Epicrisis:—Again failure to enter duodenum, obstruction at cardia and at pylorus as previously noted.

May 18th, Test 3:—Child has vomited less since last passage of tube. Is getting mixture of milk containing approximately 2 per cent. fat, 6 per cent. sugar, and 1 per cent. proteids.

4:15 p. m., No. 12 French catheter introduced into stomach, and a small quantity of very acid Congo + fluid evacuated. Obstruction at cardia at 15 cm. noted as previously.

4:45 p. m., tube reintroduced, and at once golden, faintly alkaline fluid was obtained; 8 c.cm. aspirated with the tube introduced 22 to 27 cm. (This fluid was found to contain the pancreatic ferments, amylase, protease, and lipase in considerable amounts.)

5:10 p. m., tube removed. Pylorus probably at 21 cm. level.

5:30 p. m., 6 mm. ball-tube introduced. This could not be advanced beyond the cardia without having the baby swallow water. In ten minutes it did not pass the pylorus.

Epicrisis:—At the third test we were able to enter the duodenum, as proved by aspirating bile, and a large quantity of fluid containing all the pancreatic ferments. The pathological condition in this case, therefore, would seem to have been a spasm of the pylorus and cardia, rather than an organic stenosis. If a stenosis did exist, it could not have been present to a marked degree.

May 27th, Test 4:—Baby still vomiting repeatedly. 6 mm. ball-tube passed through the cardia and the pylorus by means of having the baby swallow water (accessory method). Bile obtained, and a large amount (6 c.cm.) of pancreatic juice containing the three ferments. In duodenum thirty minutes.

June 1st, Test 5:—Baby still has propulsive vomiting. Six mm. ball-tube passed with difficulty (accessory method); a marked grip of the pylorus noted; bile obtained; tube then withdrawn.

June 9th, Test 6:—Infant had been given paregoric to stop the vomiting, but without effect. Condition very poor. Weight 4 lb., 12 oz.

4:30 p. m., 6 mm. tube passed through pylorus, by aid of water.

4:55 p. m., reintroduced. Two ounces of milk-mixture fed slowly into duodenum.

June 10th, Test 7:—10 a. m., inserted tube into duodenum again; 11 a. m., 8 c. cm. of bile-colored fluid obtained in one hour. This fluid was alkaline, and contained the three pancreatic ferments. Pyloric tugging marked when tube was withdrawn from duodenum.

In all, seven tests were carried out on this infant. In the first two attempts we were unable to pass the catheter into the intestine. In the others this was accomplished with difficulty, and only by the aid of introducing water into the stomach. This technical resort is very helpful, as the pylorus relaxes to allow the water to pass through, and in this way the catheter also obtains access to the duodenum. For the sake of brevity, this device, for which we do not claim originality, has been referred to in the notes as the 'accessory method.' It is now always made use of in passing the catheter. In this case where a spasm of the cardia as well as of the pylorus existed, this method proved especially helpful in relaxing both sphincters. It is of interest to note that in addition to the increased amount of gastric secretion which has been so frequently observed in conjunction with pyloric spasm, there was in this case, as evidenced in the second and third test, an increased flow of pancreatic secretion, 'pancreatic succorhea,' as compared with the amount usually obtained.

What does the passage of the pylorus indicate clinically? Is the pylorus permeable for the catheter when and whenever it is obstructed by spasm? Is it permeable when it is obstructed by hypertrophy of the musculature? Without entering into a discussion of this difficult subject, we may state that we believe that the catheter furnishes, at the present time, the best method of differentiating between these two conditions, and that wherever it is possible to insert a No. 15 French catheter into the duodenum, organic stenosis is so slight that it can be disregarded from a clinical point of view. We do not mean to say that stenosis may not exist in such cases, but that if we are to differentiate clinically between organic and functional conditions, the obstruction in these instances must be regarded as spastic in nature and the disturbance as functional. We do not, however, insist upon the converse of this statement, and claim that if we fail to pass the pylorus the obstruction is necessarily organic, for clinical experience has shown, and post-mortem investigation has verified the fact, that even a functional obstruction may be complete and lead to death from inanition.

DUODENAL FEEDING.

In infants persistent vomiting results at times in extreme inanition or even in death. We see this most frequently in cases of pyloric stenosis or of pylorospasm. The vomiting persists in spite of all our efforts to relieve the spasm or to provide appropriate food. But in addition to this well-known group of cases, there are others less sharply defined, where vomiting occurs and persists without obstruction of the pylorus or other apparent cause, or where it complicates an acute infectious disease and threatens or saps the life of the infant. In addition to various dietetic methods of treat-

ment, we now employ duodenal alimentation in these cases, with the object of circumventing the irritable stomach. Duodenal feeding has been used in adults, apparently with success, by Einhorn and by others, especially in cases of gastric and duodenal ulcers. In a previous paper* the author recommended this procedure for infants and published some instances where it had been successfully employed. This report included detailed histories and weight charts showing the improvement following this method of feeding.

The technique of this therapeutic procedure is important. For the purpose of feeding, the catheter is introduced in the usual way and is inserted to about the 40 cm. mark. When it has entered this distance, we refrain from moving it in or out in order not to irritate the intestine. For the same reason, as well as on other physiological grounds, the milk is warmed to blood-heat. It is probably also an advantage, judging from experiments *in vitro*, to have the milk peptonized, although we have many times given raw milk in this way without observing signs or symptoms of indigestion. The infant must be fed slowly. In some cases this precaution is forced on us, as the fluid enters the intestine with difficulty, and it becomes necessary even to force it onward by means of gentle pressure which is most readily exerted with the aid of the aspirating bulb. But where the fluid has a tendency to run rapidly through the funnel, its flow should be obstructed and from ten to twenty minutes consumed by the feeding. Otherwise we run the risk of overdistending the gut and of causing regurgitation of the fluid from the intestine into the stomach. Indeed, this happens to a certain extent whenever we introduce considerable quantities of liquid directly into the intestine. We then find that some of it, perhaps from 20 to 30 c. cm., has found its way back to the stomach and may later be regurgitated, although the bulk of the food has been satisfactorily retained.

An infant will not retain the catheter throughout the day, so that we cannot feed through it every few hours, as in the case of an adult. It thus becomes necessary to reintroduce the catheter every time we wish to feed the infant. This has its disadvantages, as in some cases of spasm there is considerable difficulty in traversing the pylorus, and passing the catheter incites gagging and retching. In some extreme instances, on account of this difficulty, I have had a nurse hold the catheter in place throughout the day, so that several feedings could be given without the necessity of reinserting it; it was then withdrawn and reintroduced on the following morning.** In some cases I have given chloral hydrate by rectum in

*Hess: The Use of a Simple Duodenal Catheter in the Diagnosis and Treatment of Certain Cases of Vomiting in Infants. (*Amer. Journ. Dis. Child.*, No. 3, p. 133, 1912.)

**Recently a retention or balloon-catheter has been devised for this purpose (*Am. Journ. Dis. of Child.*, p. 428, June, 1914). Its practical scope remains to be ascertained in the clinic.

order to quiet the infant, and in this way have succeeded in having the catheter retained. However, even with this aid, if there is excessive vomiting, the catheter may be rejected before the appointed hour for a subsequent feeding.

It has been pointed out by Meyer that in many cases of pylorospasm death results, not from inanition, as would be supposed, but from alimentary intoxication brought about by giving excessive quantities of food. Others have also reported experiences of this nature. These reports are of special interest in connection with duodenal feeding, as it can be readily understood that there is a temptation to feed large amounts of fluid directly into the duodenum. The cause of the alimentary intoxication complicating pylorospasm is probably due to relaxation of the sphincter, which occurs late in the disease. In the course of the catheterization of a large number of infants, some normal, some having increased tonicity, and still others having spasm of the pylorus, we were surprised to find how the tonus of the pyloric sphincter varied from day to day. On one occasion it was almost impossible to enter the duodenum, on another, this result could be accomplished without difficulty. This variability probably accounts for the well-known alterations in the degree of vomiting and other clinical symptoms of the disease. We mention it at this time, however, merely in connection with the 'terminal' alimentary intoxication; for in several instances we have noted that for some days, or even a week or more, before the child died, the pylorus was very readily traversable and there was cessation of vomiting and of other signs of obstruction. Recently an infant was admitted to the hospital, ten weeks old, weighing 6 lb. and 3 oz., who had evidently suffered from pylorospasm for some time. Upon admission the pylorus was found markedly spastic. A few days later, however, we were surprised to find it relaxed, as proved by repeated tests. The infant vomited only small amounts, the stools now contained food residue. On the sixth day after admission the temperature rose, and continued elevated to about 101° F. (on the seventh and eighth days). The infant was then starved for a period of twenty-four hours and the temperature at once dropped to normal. The child, however, died a few days later. We look upon this case as an instance of alimentary intoxication brought about by the terminal relaxation of the pyloric sphincter. The spasm of the pylorus, which primarily caused all the disturbance, had finally become a protective mechanism for the emaciated infant, and when the sphincter relaxed, the food poured into the intestine and overwhelmed the starved organism.

Duodenal feeding may be employed in a case every three or four hours, in other words, exclusively; or it may be used occasionally,

perhaps once or twice a day. I have used it in many cases in this occasional way; for instance, in cases of infants with pyelitis who vomit frequently, duodenal feeding has been given once or twice a day, or in cases of grippe or pneumonia the same method of procedure has been followed. As stated above, we have reported elsewhere upon definite cases where the tide was turned by means of this method of alimentation. Others have recently also been able to report successes. A case reported by Putzig is especially convincing, as other methods were first resorted to without avail, and as feeding through the catheter was at once accompanied, as the writer remarks, "by striking success" (*mit erklatanter Erfolg*). Langstein, Bamberg, Nöggerath, and Wolff have also reported favorable results from duodenal feeding. The last mentioned author gives a small amount of anesthesin just before introducing the catheter. We also have made use of this local anesthetic in order to inhibit gagging, but discontinued it as it was found ineffective. In fact we have found no drug which facilitates the passage of the catheter in cases of spasm, although it seems reasonable to expect that a therapeutic aid may be found. Opium, in the form of paregoric, is of no value; atropine of greater value; papaverin, recommended recently by Pal and Holzkecht in these cases, deserves to be tested in connection with duodenal catheterization. The effect of a general anesthetic of nitrous oxide, ether, or chloroform should also be ascertained in order to learn whether these narcotics facilitate the passage of the pylorus by means of the simple catheter and more especially by the retention or balloon-catheter. General narcotics, however, would not seem to offer the desired aid, if we draw an analogy from the experience of the surgeons, who report finding enterospasm and other visceral spasms in the course of laparotomies.

16 West 86th St.

THE PHYSICAL DIAGNOSIS OF DISPLACEMENTS OF
THE COLON.

By JOHN H. MUSSEY, JR., M. D., of Philadelphia,Instructor of Medicine, University of Pennsylvania, Medical Department;
Physician to the Philadelphia General Hospital, etc.

The very extensive present-day employment of Roentgen rays in the diagnosis of gastro-intestinal disorders has resulted in the overshadowing of the older methods of diagnosis by which, through physical means, the various disturbances of this tract were demonstrated. This statement is especially true in reference to the diagnosis of displacements of the colon so that at the present time the Roentgen ray alone is considered capable of demonstrating such lesions. While the unquestionable value of the Roentgen ray in the study of the physiology of the gastro-intestinal tract and in the diagnosis of disorders therein cannot be gainsaid, still there are times when this diagnostic aid cannot be employed. The Roentgen laboratory is not accessible to everyone, and even if it is, various other obstacles may prevent its use. In such cases resource must be had to other methods of diagnosis, which, in the great majority of cases, will yield sufficient information upon which to base an opinion as to the probable disorder. That such measures are of value, the writer will attempt to show, but before doing so will discuss briefly in what way displacements of the colon may be conformatory evidence in making the diagnosis of splanchnoptosis and in what way they may produce disease.

A ptosed colon is one of the triad of anatomical derangements upon which Glénard based his diagnosis of splanchnoptosis, the other two being a displaced kidney and a deformed liver. It is not always possible to demonstrate all these three abnormalities, so that two of them are usually sufficient for a diagnosis in conjunction with the habitus and with the symptoms of general visceroptosis. The ptosed colon is probably sought for less frequently than the liver or kidney changes, but when demonstrable is a splendid aid in the diagnosis of this protean disorder which requires unceasing attention to ameliorate when producing symptoms.

The discussion upon the secondary results of ptosis of the colon still rages. What the eventual result of this controversy will be, cannot be foretold. However, as long as the decision is in abeyance, as to what part a markedly ptosed colon plays in the production of intestinal stasis, when such a condition is found the patient should

be given the benefit of the doubt and measures taken to correct the displacement. Stasis, with all its secondary complications, is supposed to result mechanically, if the colon is ptosed, either through marked lowering of the transverse portion of the organ or through the production of kinks in the region of the hepatic or splenic flexure. That such is the case is certainly very questionable. Hertz has apparently shown most convincingly that ptosis of the colon does not cause stasis of the intestinal contents and resulting constipation. He has shown that the filling of the cecum and the ascending colon is accomplished by the passage of chyme from the ileum. In response to a stimulus, which arises only three or four times during the day, the contents of the overfilled ascending colon are carried by a powerful peristaltic wave across the transverse colon to the splenic flexure. Here the contents pass into the remaining bowel to remain until defecation. This takes place in response to the same stimulus which has pushed the fecal mass along the upper colon, if the lower colon is full. Hertz says that in a large number of fluoroscopic examinations he has rarely observed any serious delay to the onward passage of the feces at the splenic flexure; never at the hepatic flexure nor in the transverse portion of the colon, no matter how greatly ptosed. Certainly the large majority of roentgenologists will agree with him. There is, however, another condition which in some way is directly associated with ptosis of the colon. The great majority of patients suffering from mucus colitis are found to have a ptosed colon. Whether this is a direct or indirect result of the dropping of the colon, certainly measures to restore the organ to nearer its normal position result in improvement in the mucous discharges. Furthermore, as the ptosis of the colon is only part of a universal descent of the intestines, the general and mechanic measures taken to improve this condition will also markedly improve the symptoms arising from the splanchnoptosis.

The methods of physical diagnosis applicable to the demonstration of colonic ptosis are the usual ones of inspection, palpation, percussion and auscultation. These methods may be made more exact by inflation of the colon. To do this there is required a long rectal tube and a bulb with which the air is blown into the tube. The patient should first have the bowels well cleaned out by a good purge. The tube should be of sufficient length so that when placed well into the rectum, it may protrude at least 2 ft. The bulb is then inserted into the distal end of the tube and air is blown into it until the patient complains of a certain amount of discomfort. The ileocecal valve, up to this point, is strong enough to prevent the entrance of the air into the small gut. The air from the large intestine can be expelled at once by removing the bulb from the

end of the tube. Under separate heads inflation of the colon will be considered in connection with the other usual methods.

Inspection.—As a rule it is impossible to see the colon under normal conditions. When it is inflated the outline frequently can be clearly seen in thin individuals. In such persons, as the amount of air in the organ is increased, the transverse portion may be seen several inches from the position in which it was just noted. The cecum may also be seen as an indefinite tumor in the right iliac fossa.

Palpation.—When there is splachnoptosis, the transverse colon may be felt at times as a thin cord extending across the abdomen. Cohnheim recommends the following method: "The physician should place both hands close to each other on the middle of the abdomen, the finger-tips extending somewhat above the umbilicus, and while the patient inspires and expires deeply with diaphragmatic respiration, should roll up and down with the tips of his fingers and at the beginning of each expiration press downward lightly." The cecum is palpable in about 20 per cent. of cases, according to Sailer, and may be felt in varying degrees from a soft, indefinite, movable mass to a distinctly palpable tympanitic balloon-like body. When the colon is inflated the cecum fills up with air and may be distinctly palpated in a large number of cases.

Percussion.—The simple methods of percussion are usually valueless in outlining the position of the colon as the tympany of the large bowel is obscured by the tympany of the underlying small bowel. A combination of auscultation and percussion, when the colon is air-filled, is a most satisfactory method of determining the position of the large intestine. The bowel is moderately distended with air and the bell of a binaural stethoscope then placed over the cecum. Light percussion is begun just above the symphysis and continued upward until there is a distinctive change in the quality and intensity of the sound heard over the cecum. This will mark the lower limit of the transverse colon. By moving the percussing hand in different directions towards the midline and marking upon the skin when the note is altered, the colon's position may be accurately delimited.

Auscultation.—Needless to state, ordinary auscultation of the colon is worthless in determining the position of the organ. The writer has found, however, that a modification of the well-known auscultatory inflation method of outlining the stomach may be employed with distinct advantage. The method seems to be accurate as controlled by a small number of Roentgen ray examinations. It is used in the following manner: The stethoscope is placed just above the symphysis pubis and air is then pumped into the tube. With each squeeze of the bulb the stethoscope is moved upward about an inch. When the transverse colon is reached there is a distinct change in the character of the note heard over the ab-

domen. The tone becomes clearer and more musical and at times the onrushing air may be plainly heard. By moving the bell of the stethoscope from the distant borders of the abdomen towards the midline, the several portions of the colon may be delimited. No trouble will be found in marking off the borders of the descending colon, the splenic flexure, the transverse portion and the cecum. Occasionally, in the region of the hepatic flexure and the upper portion of the ascending colon, the change in tone is not sufficiently clear to enable one accurately to outline these structures. However, as soon as the region of the cecum is approached, the auscultatory change is most marked and this portion of the intestine can be delimited very exactly.

The air should be allowed to escape from the colon after a small amount is injected. A quantity sufficient to cause discomfort or to pass the barrier of the ileocecal valve to any extent should not be forced in. Moreover, if only a small quantity of air is used there will not result the ballooning upwards of the colon towards the diaphragm which will distort the normal relations of the organ. If a sufficiently long tube is employed so that the end may be brought anteriorly, the patient may stand up and the organ outlined in the upright position. It is astonishing to note the difference in the position of the transverse colon when the patient is in the horizontal and in the upright position—variations of four or five inches are frequently encountered.

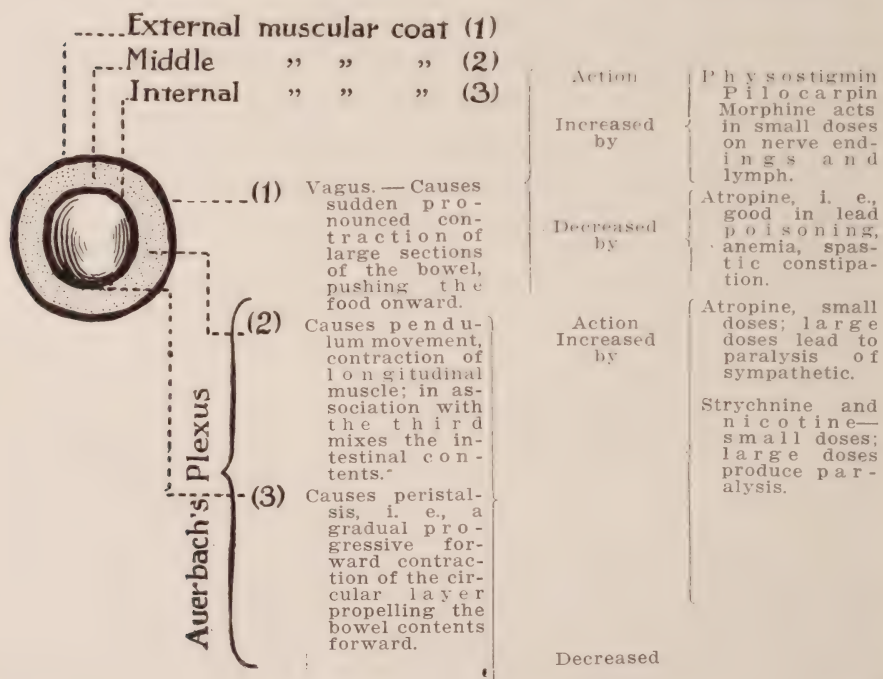
Conclusion.—The routine outlining of the colon in the course of a physical examination is neither necessary nor important. In conjunction with their findings, however, such an examination may be indicated. If such is the case, there are certain methods of examination which will give accurate and valuable information when for various reasons it is impossible to make use of the fluoroscope and plate.

FUNCTIONAL ILEUS.

By RICHARD J. BEHAN, M. D., of New York.

Ordinarily under the term ileus is meant a more or less complete obstruction of the gastro-intestinal tract—the obstruction occurring anywhere from the cardiac opening of the esophagus to the end of the sigmoid flexure of the colon. This obstruction may be either mechanical or functional. The mechanical obstruction is the result of intra-, inter-, or extra-mural changes in the walls of the intestine or stomach, and leads to ileus by the pressure on the walls. The principal factors causing intramural ileus are foreign bodies, gall-stones, enteroliths, polypi, tubercular or syphilitic cicatrices. The mural causes are local inflammatory swelling of the wall, carcinoma, sarcoma, lipoma. The extramural causes are stricture by adhesions, kinks in the bowel, intussusception, pressure by new growths or by neighboring organs. The causes of functional ileus are those factors acting upon the muscular coat of the intestinal or stomach walls by which the motility is affected. These factors may act locally, that is directly upon the wall or reflexly from a distance. The principal local factor is inflammation. It is needless to mention peritonitis and its action upon the intestinal and gastric movements. That the peritonitis always acts locally cannot be definitely determined, though cases of peritonitis are frequent in which all the coats of the bowel are not involved in the inflammatory exudate. The serosa and subserous are first involved, and then the external circular muscular coat, etc. The latter is supplied by the vagus nerve, the two inner coats being supplied by Auerbach's plexus. The early involvement of the vagus is seen from the reflex stopping of diaphragmatic respiration in the early stages of peritonitis. This is a sign that the writer has sought, for many years, in every case of suspected peritonitis. A reflex inhibition of peristalsis also occurs, though it is not entirely absent in every case of peritonitis. This may be explained by the fact that the inflammation does not in these instances extend through to the inner muscular coats and so does not affect the plexi of Auerbach, so that partial peristalsis with isolated gurglings and rumblings may be heard. However, no bowel movement occurs. Among other causes of peristaltic inhibition, acting locally, may be mentioned hemorrhages into the intestinal wall—purpura hemorrhagica (Cook, Robinson, etc.), inflammation of the intestines, as in intestinal catarrh. Thrombosis of the vena mesenterica will also cause a large turgid intestinal wall with

loss of peristalsis and dilatation. In this lesion, bloody stools will be present, vomiting (finally) of blood and of feces, diarrhea, marked abdominal pain, and blood in the peritoneal cavity. The abdomen may not be distended; slight resistance to the right of the median line with dullness may be found; liver dullness may be absent (Reitzenstein). Trauma, such as a blow on the abdomen, may produce contusions of the intestine and may indirectly lead to gangrene, as in a case of Schroeder—the contusion paralyzes the local intestinal regulating apparatus as well as deranging the reflex functional nerve activities of the intestine. A local intestinal spasm is caused by derangement in the blood-supply. According to Pal, this is one of the factors in the production of the local intestinal spasm, the result of lead colic. In still other cases local spasm of the intestine is caused by the irritant action of some substances in its lumen, as hardened feces, foreign bodies, worms, etc. Certain poisonous or irritating substances in the lumen may also cause an increased peristaltic action. Before going further, it is best to consider briefly the character of the intestinal movements revealed by the latest researches. The diagram will aid in the elucidation.



Increased peristalsis is produced by drugs stimulating the vagus and Auerbach's plexus, or by paralyzing the sympathetics which are directly antagonistic. The sympathetic excitors and therefore the drugs which to a slight degree inhibit peristalsis are nicotine, which

acts both on the sympathetic ganglia and nerve endings; adrenalin, which acts on the sympathetic nerve endings; and morphine, which acts on the splanchnics; these decrease peristalsis. The only drug which inhibits the sympathetic and the vagus is atropine, that is, it relieves the pronounced contraction caused by the vagus. The further use of these drugs will be spoken of later.

Now, since we have considered the nervomuscular apparatus of the bowel, it is well for us to delve a little deeper into the causes, symptoms, prognosis and treatment of true functional ileus. The paralysis or spasm due to nerve derangement may be peripheral or central. The peripheral irritation is either local or general. The local irritants act upon the local reflex centres (Auerbach's) in the intestinal walls, and are the products of drugs or other irritating substances in the intestinal lumen, or may be the result of changes in the wall of the bowel, as hemorrhages, etc. A peculiar case, showing the result and action of constant contraction of certain small portions of the bowel, is reported by Biernath: "A patient, fifty years of age, came to me with the probable diagnosis of appendicitis. Pain had been complained of in the region of McBurney's point, and opium had been given. With bismuth injection, a clear picture of a stricture (supposed to be a carcinoma of the sigmoid) was seen. During the night the obstruction became complete. An artificial anus was made; glycerine, physostigmin, intra-intestinal and intravenous hormonal were used. Death, however, resulted. Autopsy showed a tight stricture, 26 cm. above the anus; no ulceration. On microscopical examination, nothing except a marked thickening of the muscle (circular) was found at the point of stricture (not even a small-celled infiltration). Meltzer has described a case of spasmodic contracture of the esophagus which resembled esophageal stenosis."

That spastic contractions of the intestines are fairly common may be concluded from the work of Schwarz, who found that in one variety of constipation the furrows were well marked and very deep. The muscular action was incoordinated and very irregular, so that the bolus was divided into several small round masses, some of which were propelled forward, while others were pressed backward. This reflex spasmodic contraction of the circular (internal) layer of the muscular coat of the bowel has an analogue in cardio-spasm, and in the duodeno-pyloric reflex. By this reflex the pylorus is closed as long as the duodenal contents remain acid, but is opened as soon as the contents become alkaline.

These spastic contractions of the bowel are the result of some factor or factors causing stimulation of the vagus, the nerves of Auerbach's plexus, or the *N. pelvici*, or of factors inhibiting the sympathetic. These spastic contractions may be seen by the x-ray in so-called spastic diarrhea, the result of a lessened control of the

vagus and associated systems. They are without any organic changes in the bowel. The associated vagotonic symptoms are difficulty of breathing, marked cardiac palpitation, red spots on the face and entire body, tenesmus, hyperacidity, and pronounced sweating (Schwarz, von Bergmann). According to von Bergmann this type of diarrhea is also found in Addison's disease and is due to a weakening of the chromaffin system (*i. e.*, the adrenals, carotid, Zuckerkandl's gland, etc.). In one case (Sander's) in which ileus was present, autopsy revealed pressure by pleural adhesions on the right splanchnic nerve. The nerve was degenerated. This produced ileus by paralysis of the sympathetic.

Spastic ileus of the colon was found by Pankow. Ten days after a myoma operation, an ileus of the colon developed; an artificial anus was made above the obstruction; ileus disappeared to reappear when the anus closed, and again to disappear when the anus was again opened. This, according to Koerte, may be the result of an irritation to the mucous membrane, presence of wounds (Heidenhain), gall-stones (Koerte, Israel), ulcerative changes of the intestinal wall (Langemach), tuberculosis from retardation of nutrition, etc.

Entirely opposite in its mechanism to spasmodic ileus is paralysis of the bowel. However, it produces the same results as the spasmodic ileus—namely, an obstruction to the forward movement of the gastrointestinal contents. It may be due to local causes, producing, according to Wathen, a destruction or impairment of the neurogenic strength or myogenic force in the walls of the bowel—the result of the poisonous action of the bacterial enzymes from the intestines or the peritoneal cavity, or it may be the result of traumatism. It is a well-known fact that a smart blow on the abdomen will produce an entire cessation of intestinal peristalsis, lasting for some hours. These factors act locally upon the nerve endings in the intestinal wall, and while they are perhaps more important, are not as interesting as the reflex and central factors.

The paralysis is the result either of inhibiting the vagus, the nerves of Auerbach's plexi or the *N. pelvicus*, or is due to the stimulation of the sympathetic. In some cases only the sympathetic is affected. In these there is no dilatation of the intestine. This is due to the fact that, as shown by Kelling and others, overfilling of the stomach (analogue of the intestine) will not give rise to dilatation (without regard to the amount of the ingested food, liquids, etc., or the presence of gas) unless the vagus, that is the tone-regulating apparatus of the stomach is involved. In the intestine a considerable factor in the carrying on of peristalsis is the transmission of impulses along the intestinal wall without the aid of the central nervous system. Neumann separated segments of the bowel from all mesenteric attachment and was able in a few instances to see

contraction carried over this area. However, in no case was it carried forward over any considerable area so separated.

Paralysis of a segment of the bowel may also result from reflex causes acting from a distance, as is exemplified in a case reported by Treves, of a boy with strangulated hernia who had an ileus relieved simply by the application of ice over the site of the hernia.

Paralysis of the vagi results in dilatation of the stomach (Stieda, Cannon). This dilatation is also frequently seen in the gastric crises of tabes and sometimes in Reichmann's disease; however, from the latter condition it is distinguished by the presence of HCl in the vomitus, great thirst, and, as a rule, the absence of distension of the abdomen.

Paralytic ileus at times is the result of pressure from mesenteric glands. Fenwick reports such a case. The patient three months previous had strained himself while lifting. Nine weeks later he had an attack of abdominal pain, not localized, but occasionally more severe on the left side. The pain became continuous; constipation occurred; small diarrheal stools, mixed with blood occurred; no natural movements. Vomiting commenced; at first at intervals but during the second week became continuous. Vomitus, biliary; never offensive nor fecal. Loss of weight; no indigestion nor jaundice; recurring hiccoughs. On examination the abdomen was soft; no pain on percussion or palpation; percussion note not tympanitic except in right iliac fossa. Slight resistance to deep pressure, just above the umbilicus to the left of the median line. No abnormal distension. Temperature subnormal. Because of the vomiting, operation was delayed twelve hours and opium and brandy were given per rectum. Vomiting ceased; pulse improved greatly and the patient passed a quiet night. Operation the next day disclosed a mass of six or eight glands (stony hard) in the mesentery, close to a loop of jejunum. The loop was distended and purple, with petechial hemorrhages along the antimesenteric border. The purple color faded into the normal above and below where the gut was collapsed and empty. No stenosis. Death in seventeen hours. Autopsy showed that the interior of the strangulated loop was deeply congested and had signs of beginning ulceration. The mesenteric veins were enlarged and dilated but not thrombosed. Fenwick was inclined to think that the stasis was due to pressure on the mesenteric nerves, but it is more likely to have been the result of stasis due to pressure on the veins.

Central lesions may also act as causative factors in producing gastro-intestinal paralysis. Homburger reports a case of ileus due to luetic meningomyelitis. The antiperistalsis, etc., was relieved by atropine. The emotions also play a great part in the functioning of the bowel: fear causes diarrhea, while the neurasthenic as a rule is constipated. Ileus also frequently follows the administration

of an anesthetic; coming within twenty-four or forty-eight hours after operation, it is the result of reflex causes (Allen); occurring a few days after operation, it is due to peritonitis; occurring a long time after, it is due to adhesions.

Ileus has been reported as the result of hysteria. In Schwarz' patient there was fecal vomiting, no abdominal distension, no abdominal resistance, no bowel movement, even by the high injection of oil; clear fluid on stomach washing, etc.; operation disclosed nothing abnormal. Patient immediately recovered.

Hysterical ileus may be of the spastic or the paralytic variety. In one case Leube clearly felt the contracted bowel which he could roll beneath the fingers. Voisin reported such a case, where on autopsy only a spastic narrowing of the intestine was found. The symptoms in Rosenstein's case were fecal vomiting, cramps, and tenesmus. In Brezgmán's case the symptoms were obstipation (ten days without stool), tympany, no flatus, vomiting (fecal), incomplete loss of consciousness, etc. After an operation for prolapse the vomiting improved.

The symptoms resulting from intestinal obstruction are very likely due to a poison elaborated by the mucosa of the obstructed bowel. Such a poison has been determined by Whipple. He performed a gastro-enterostomy on dogs, washed out the duodenum, and cut off and closed both ends (just below the pancreatic duct, and just above the duodenojejunal junction). The dogs died in two days. He then isolated a toxic substance from the mucosa of this loop. This was active intravenously and subcutaneously and caused a fall in blood-pressure and temperature, profuse vomiting, diarrhea and collapse. Death occurred in two to twenty-four hours with a general picture of anaphylaxis. Autopsy showed marked splanchnic congestion—most marked in the intestinal mucosa, which was dyed a deep purple in color. Dogs immunized to the poison lived for six instead of two days, if a closed loop of bowel was isolated. However, in this respect, McLean and Andrews could not find in dogs dying from ileus any toxic material either in the gastric or duodenal contents or in the blood, either in the serum or in the corpuscles. According to McLean and Andrews death from ileus was similar to death from bleeding; the blood-pressure was lowered and the cerebral centres were imperfectly supplied with nourishment.

The general symptoms of functional ileus are

1. Vomiting which, at first, consists of the stomach contents and then, if not relieved, of bile. Finally it becomes fecal in character. The cause of this vomiting is a reflex, which causes antiperistalsis. The peristaltic wave passes down to the place on the intestine where the obstruction (be it mechanical or dynamic) is present; then it stops, but soon peristaltic waves begin to

retrograde, their excursions becoming wider and wider until the entire segment of the intestine and stomach proximal to the lesion is undergoing reversed peristalsis. To prove that the bowel actually can carry antiperistaltic waves, Kirstein resected a small part of the small intestine and sutured it in its reversed position, while Muhsam did the same with the entire small intestine. In both cases the intestinal peristalsis was carried on in the normal direction. Hoorweg and Treves injected bismuth and starch in the rectum and were able to prove its presence in the vomitus, thus showing that antiperistalsis can take place along the entire intestinal tract from the rectum to the mouth.

2. Temperature, generally low, frequently subnormal.

3. Pulse at first not much changed, then becomes more and more rapid. The rapidity, however, is no indication of the severity of the lesion.

4. Respiration is frequently slightly increased.

5. Hiccoughing is also an early symptom.

6. Locally, distension of the abdomen may be noted. In some cases abdominal distension may not be marked, but generally on close examination, a more or less definite, tumor-like swelling may be found in some part of the abdomen. If the ileus is of the gastroduodenal type, the swelling will be in the epigastrium and slightly to the right; if of the intestine (small), the swelling and resistance is to the right side. Over this tumor-like mass, vermicular, progressive motion (peristalsis) may be noticed if the abdominal wall is not too thick. On auscultation, gurgling may be heard as the gas passes through the non-active portion of the bowel into the distal part. If the ileus is of the gastromesenteric type, the tumor mass (stomach and duodenum) may give rise to a splashing sound on shaking. In the latter instance, on passing the stomach tube, large quantities of greenish liquid are removed. In ileus, as a rule, the abdomen is not painful, and this frequently deceives the inexperienced observer. Indeed, it is said that most men seldom recognize their first case of ileus until operative measures are too late. Late in the disease, abdominal pain due, as a rule, to a slight peritonitis is frequently present. In gastromesenteric ileus, coming on after operation, the patient complains at first more of a distension, then of a pronounced pain in the epigastrium. After some days the pain becomes less. At the same time the character of the vomiting changes. It is less forced and seems more of a regurgitation. The vomitus is a dark green or brown. The quantity may be as much as several pints at one time. Then as paralysis becomes complete, the pain ceases, but the general condition of the patient gradually becomes worse. The pulse increases in rapidity, thirst is more marked, emaciation is marked, respiration is more frequent, urine is scanty, stools are clay-colored (absence of bile—Stavely).

In children, spasm of the bowel is frequently indicated by the colic of which they complain. This colic is also marked in the adult and is most common in spastic diarrheas.

The *x*-ray offers a refined means of determining the exact location of the ileus.

DIAGNOSIS.

It is not always easy to diagnose an ileus, be it intestinal or gastromesenteric in type. If one is called to see a patient who has been vomiting more or less constantly for some time previous, and who complains of inability to move the bowels, and if on examination of the abdomen we find a tumor-like mass or even an undefined resistance in one certain place, we should make a tentative diagnosis of obstruction of the bowel and then proceed to eliminate all conditions which may be confused with it. If a tumor mass is present we at once listen over it for peristaltic gurglings, which, if present, identify the mass as being a portion of the bowel. If they are not present, we must then eliminate all conditions causing a tumor-like enlargement, such as pancreatic cyst, enlarged mesenteric glands, or localized walled-off tubercular peritonitis. The latter is hardest to eliminate since the intestine in the tubercular mass still carries on its function and peristaltic gurgling is heard; at times also a localized dilatation of the bowel occurs from obstruction by bands, adhesions, etc. A diagnostic point of importance in tubercular peritonitis is the presence of a Moro reaction and the slow insidious onset. The abdomen, too, is generally enlarged and may contain fluid. Ovarian cysts have been mistaken for dilated stomach, but the absence of resonance or tympany and the presence of dullness over the entire mass should be of great assistance. On the other hand, cases of gastromesenteric ileus have been mistaken for ovarian cysts, and in a few cases the correct diagnosis was made only upon cutting into the stomach. In some instances where a pediculated cyst has become twisted, the vomiting, etc. is excessive and continuous, but there is also present, as a rule, pain referred to areas associated with the involved organ. Misplaced organs, such as the kidney and gall-bladder, should also be eliminated.

If now we are sure that the obstruction is in the intestine alone, then the following factors should be inquired into—namely, if the patient has swallowed a foreign body, or has had gall-stones, or had a recent injury to the abdomen. The presence or absence of syphilis and tuberculosis should also be noted. If they are or have been present, stricture of the bowel should be thought of. The presence or absence of indican is also of diagnostic importance.

Pain is not a prominent symptom in dynamic or paralytic ileus. It is, as a rule, marked only in the early stages, before complete dilatation, with absence of peristalsis, has occurred in the proximal

segment. Late in the disease it may also be complained of, due to the associated peritonitis which has arisen.

The acute, stormy onset of a gastromesenteric ileus following operation is seldom mistaken for any other lesion. The vomiting of great quantities of greenish fluid, with the presence of a large tympanitic tumor in the upper abdomen, will identify it.

In all instances the pulse-rate is not exceedingly rapid and may not be increased to any considerable degree. The temperature also is not much above, and may be below, normal. The presence of vomiting (persistent and finally fecal) with a slow pulse and no fever is sufficient to make a tentative diagnosis of gastro-intestinal obstruction.

In our diagnostic range, we should not forget intussusception (very common as a cause of intestinal obstruction in children). The presence of blood in the stools is, in this disease, a differential sign of value. Strangulated hernia and volvulus should be excluded.

If we have excluded all the above lesions, we have left only spasmodic and paralytic ileus. The presence of a contracted band in the intestine, or of a slight persistent tympanitic mass at one point in the abdomen, will, in the early stages, help to differentiate the one from the other. In the later stages, the associated signs of involvement of the vagus system, such as sweating, bradycardia, red spots on face and entire body, difficulty of breathing, hyperacidity, tend to make the diagnosis easier.

PROGNOSIS.

According to Kuttner, the prognosis is not good. Ninety-three cases of dynamic ileus (29.4 per cent. of all cases of intestinal obstruction) showed a mortality of 60 per cent., the highest with the exception of strangulation ileus, which had a mortality of 61 per cent. (105 cases). Acute dilatation of the stomach also had a high mortality—63.5 per cent. The causes of death in ileus are given as follows:—

(a) Loss of fluid (producing signs of tetany). If an animal loses 22 per cent. of its tissue fluid, it dies (Richardson).

(b) Pressure on heart and lungs (gastromesenteric ileus—Oppenheim).

(c) Toxemia from absorption of toxins from the occluded loop of bowel (Clairmont and Ranzi).

TREATMENT.

The essentials of treatment in all forms of ileus, as well expressed by McLean, are to relieve the distension and fill up the depleted vessels. The first, in case of gastromesenteric ileus, is accomplished by complete, thorough and frequently repeated washing of the stomach. Thorough stomach washing is to be recommended

in any form of ileus. In washing the stomach it is well to elevate the hips of the patient and to withdraw the tube very slowly so that all the fluid may be removed. Withdraw all food and drink. Give large and copious injections of salt solution, bag 1½ ft. above the rectum, pelvis elevated. If after twelve hours no bile is seen in the fluid expelled, operation should be undertaken (Laffler, Nothnagel). Continuous Murphy is also of value. Saline should also be given subcutaneously and, if the patient is very sick, intravenously. In some cases, particularly in gastromesenteric ileus, in which the stomach is dilated, the prone position, with the patient slightly turned to the right with his hips elevated, will relieve the distension and facilitate the emptying of the stomach. In some instances the high frequency current over the abdomen is supposed to have done good. Heat should also be applied to the abdomen.

Drugs.—Cathartics are absolutely contraindicated. They are injurious “by stimulating in vain the peristalsis of, and increasing the amount of fluid in, the proximal portion of the bowel; they favor intestinal putrefaction with absorption of toxic products; cause a reverse flow of foul, offensive fluid into the stomach with the production of exhausting vomiting; so damage the bowel immediately cephalad of the obstruction as to favor the migration of microbes into and through its walls; increase an intussusception; hasten the cutting through of a constricting band or ring; aid in the extension of paralysis, and facilitate the dissemination of infection.”

One of the best drugs is morphine. It decreases the vagus irritation, dampens irritating reflexes, and stimulates the sympathetic. This would be most useful in spastic ileus, but harmful in the paralytic form. In that form of ileus due to vagus involvement, it is indicated; also in local irritative ileus due to reflexes from irritative foci in the abdomen, as in peritonitis, etc. Atropine is also useful in spastic ileus. In small doses it paralyzes the vagus and stimulates Auerbach’s plexi of spinal nerves. Eserine is of value in paralytic ileus. It acts on the vagus and causes contraction of the distended bowel, at least it increases the tone of the intestinal muscles. Pilocarpin may also be used for the same purpose. Strychnine stimulates the spinal nerve endings in Auerbach’s plexus, and should be given in large doses—¼ to ½ gr. (Sander). In the latter dose it frequently causes poisonous symptoms. Adrenalin is useful in paralytic ileus (see Table).

If the obstruction is not relieved inside of twenty-four hours, especially if it seems to be getting worse, operation should be undertaken.

All mechanical obstructing factors should be removed. If the ileus is of the spasmodic or paralytic type, but little can be done for it, except possibly a gastro-jejunosomy in gastromesenteric ileus, or an entero-enterostomy, or colotomy. These are of doubtful

value, for when the ileus is corrected in one place it frequently recurs in another. In fact, the operative interference seems to be a stimulating factor for its further recurrence, so that it seems that medical measures are more successful in coping with spastic or paralytic ileus than are surgical ones. However, one must not forget that an exploratory operation has saved many a patient's life.

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THE EXAMINATION OF THE GASTRODUODENAL TRACT.

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Disorders of the alimentary tract may, and should be, investigated from several points of view. A detailed history and a thorough general examination of the patient oftentimes reveals the seat of the lesion in some other organ outside the gastro-intestinal canal. In primary digestive disturbances the determination of the secretory power of the digestive organs is a procedure of utmost importance, for a clear conception of the state of this power is paramount to a successful plan of treatment. Of late, however, progress in the interpretation of the physiologic, and, therefore, of pathologic and therapeutic, processes has been made along the motor phenomenon of the alimentary tract by means of Roentgen rays initiated by Cannon. At present the peristaltic activity is being observed under the fluoroscopic screen, while mechanical derangement, such as abnormalities in the shape, size, and position of the stomach and colon, can be recorded upon an *x*-ray plate.

Of all procedures, chemical analysis is the most important. Until a few years ago the secretory power of the stomach alone could be readily ascertained by the examination of a specimen of gastric contents after an Ewald test-meal. The production of pyloric regurgitation following the ingestion of oil and massage along the right hypochondriac region, as suggested by Pavlov, is a process of independable results. Hence, for ascertaining the functional activity of the pancreas, one must have resorted to the examination of enzymes in the stools—an unpleasant procedure with inconstant findings. But we owe it to the ingenuity of Gross and Einhorn—the inventors of the duodenal tube—and Hess, the originator of the duodenal catheter for infants, that we are now able to study the digestive power of the pancreas by the examination of a fresh specimen of duodenal contents.

The process of obtaining direct evidence of the state of the secretory power of the digestive organs has been made difficult by the very means which we employ. The Kussmaul stomach-tube has been in vogue for nearly fifty years. The operator always felt the difficulties encountered in its use, and was aware of its shortcomings, but never stopped to consider the correction of same. Similarly, with the original duodenal tubes. At their birth, these represented a mere theory—the desire of the inventors to reach into the duodenum. However, their development and perfection

was brought about by further experience, and their application for daily use, at present, is a generally admitted fact. In this paper, the writer aims to describe the improvement in the procedure of the examination of the gastroduodenal tract by means of new and modified instruments.

In a former communication* the writer has singled out the disadvantages of the stomach-tube, which, briefly stated, are as follow:—

Its thick and firm tubing causes its long axis to be thrown into a curve and, hence, on introduction, it does not reach the dependent portion of the stomach, and its eyes are above the upper level of

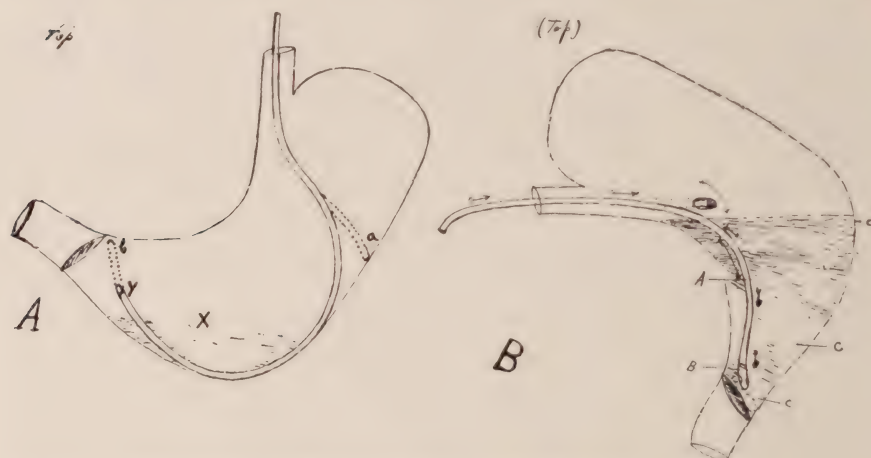


Fig. 1.—Behavior of the stomach-tube in the stomach.

(A) The old stomach-tube.

(a) and (b) Points where tip strikes the mucosa on introduction of the tube.

(x) Residuum of gastric contents after removal of a test-meal.

(y) Eyes of the tube above the upper level of the residuum.

(B) The modified stomach-tube (patient on the right side).

(a) Along the lesser curvature.

(b) Eyes of tube at the dependent portion—pylorus.

(c) Gastric contents collected toward the pylorus.

the gastric contents resulting in imperfect evacuation of the stomach, and, therefore, a moderate degree of gastric stasis is frequently overlooked (Fig. 1 A). Secondly, its passage through the oral-esophageal tract is essentially a forcible one, induced by the introducing finger, and, therefore, on reaching into the stomach it strikes some point or other in the gastric mucosa, causing gagging, vomiting, exhaustion, and sometimes traumatism. The constant adjustment of its eyes to the level of the gastric contents by the operator, during aspiration, greatly aids in the production of these unpleas-

*Palefski: A Modified Stomach-Tube. (*Med. Record*, September 27th, 1913.)

ant effects. It is to be used, therefore, with caution in the old and debilitated in gastric and pyloric ulcers, advanced cardiac and respiratory diseases.

This arraignment against the stomach tube was upheld by the findings in the experimental studies of Wagner, and Dodd.* By passing the stomach-tube and observing under the fluoroscopic screen, they noted that the tube on emerging from the cardiac end of the esophagus invariably deflected toward the left and touched the wall of the stomach, well above the dependent portion. On further passage, its tip assumed an upward direction and went back toward the cardia, in which course it skimmed only the upper surface of the residuum. Even in a reclining right-sided posture they failed to aspirate the residuum which was detected by the Roentgen rays.

In describing his new and modified instruments, the writer supports his claims on an experience of many hundreds of examinations within the last three years. Their improvement seemed to be of vital importance and paramount to a thorough examination of the gastroduodenal tract.

THE MODIFIED STOMACH-TUBE.

This rectifies the disadvantages of the old stomach-tube. Its tubing is soft and collapsible, and its passage through the oral-esophageal tract is uninfluenced by the introducing finger, as owing to its weighted tip, it depends upon the force of gravity assisted by deglutition, thus minimizing the source of discomfort to the patient and possible traumatism to the gastric mucosa, while, by seeking the dependent portion of the stomach, it facilitates evacuation. By referring to Fig. 2, the reader will note two forms of weighted and collapsible stomach-tubes—A and B. Tube A is the one the writer originally described and which he has been using since, as it offers the best means of removal of gastric contents, and as nearly as possible replaces the Kussmaul tube. It consists of a gold-plated lead tip weighing 140 gr., $\frac{3}{4}$ in. long, 25 French in circumference, one-half of which is solid, serving as a weight, and the other half is hollow and perforated, terminating in a neck to which is being attached by means of silk thread No. 1, soft and collapsible pure gum red tubing 55 cm. long, 25 French and 6 by 8 mm. in its diameters. It is marked off at 40 and 50 cm. distance from the metallic tip, showing when the latter has reached the cardia and pylorus respectively. The lumen of the tube, neck and eyes of the metallic tip are of equal diameters, thus allowing ready passage of the gastric contents. Some patients at the first examination experience difficulty in swallowing the metallic tip. In such

*Sources of Error in the Use of the Stomach-Tube for Diagnosis. (*Arch. Int. Med.*, November, 1913.)

cases the writer employs a flexible stylet consisting of double length No. 8 French catheter of gum elastic. When introduced into the stomach-tube the latter is made temporarily more resilient, thus allowing the operator to bring the metallic tip directly beyond the pharynx, after which the stylet is removed and the tube is allowed to pass downward by forced gravity. The technique of its introduction requires some skill, which the writer amply emphasized in his original article, and which he since came to recognize more and more as a factor in its use by beginners. Its improved form

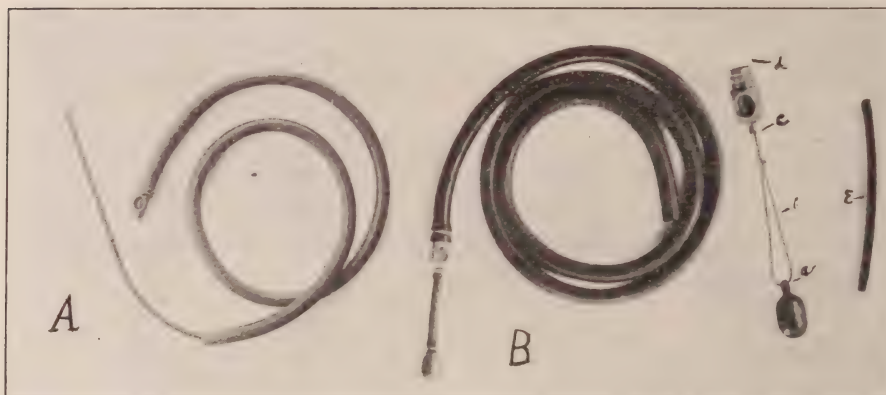


Fig. 2.—Collapsible and weighted stomach-tube (Geo. Tiemann and Co., New York).

- (A) Author's original modified stomach-tube with stylet *in situ*.
- (B) Author's improved modified stomach-tube without stylet.
 - (a) Gold-plated lead ball with perforated neck.
 - (b) Silk thread suspending (a) from (c).
 - (c) Aluminum piece with eyes.
 - (d) Pure gum tubing attached to the neck of (e).
 - (e) Covering (b) tied to (a) and (c).

is seen in Fig. 2 B, which consists of a soft and collapsible tubing 55 cm. long, 20 French, and 4 by 6 mm. in diameters, to one end of which is attached an aluminum piece and which has two eyes. From a perforated neck of this aluminum piece is suspended, by means of a silk thread and thin tubing 1 in. long, the former running through the latter, a gold-plated lead ball 130 gr., about $\frac{3}{8}$ in. long and 25 French in its widest circumference. The patient readily swallows the ball, which carries along the aluminum piece and tubing into the stomach. The operator requires no skill in its use, and hence this form of the modified stomach-tube should be employed by the beginner, or at the first examination of a patient who never has experienced the introduction of the stomach-tube. After some experience with a few patients the other form with the stylet can be readily employed.

Procedure.—It is best described in three stages. Stage 1 (Fig. 3) during which the tube passes through the mouth and pharynx. The patient, in the recumbent posture, rests and extends the head over a pillow with the mouth wide open. The operator places the metallic tip on the dorsum of the tongue and tells patient to swallow it, after which the latter assumes the erect posture.

Stage 2 (Fig. 4).—The patient having assumed the erect posture with open mouth, breathes deeply and slowly. The operator, supporting the other end, allows the weighted tube to move into the esophagus by gravity until mark 40 cm. has approached the lips. The length of time required for the passage of the modified stomach-tube becomes an unimportant factor owing to the fact, that by its use the irritation and discomfort have been minimized, and therefore the more slowly this stage is performed the more



Fig. 3.—Introduction of the modified stomach-tube and improved duodenal tube (Stage 1). Patient in recumbent posture, mouth wide open. Operator in front of the patient, introducing bulb into pharynx with the index finger of left hand.

readily the tube reaches the cardia. There is also a tendency on the part of the patient to chew the tube, which action invariably hinders its passage. The patient, therefore, must be instructed to keep his lips apart.

Stage 3 (Fig. 6).—When the tube has reached the cardia, as evidenced by the mark 40 cm. near the lips, the patient places himself on the right side, the right cheek resting on the pillow, the mouth open and the head brought slightly forward. In this posture the pylorus (Fig. 1 B) is the most dependent part of the stomach, and gravity will cause the weighted tube to move along the lesser curvature toward the pylorus, where also the gastric

contents have collected, while the tube will be seen moving into the mouth 10 to 15 cm. more. Its eyes are constantly underneath the level of the gastric contents, and hence the stomach now can be completely evacuated—a remote possibility with the ordinary stomach-tube.*

Advantages of the Modified Stomach-Tube.—(1) Its tubing has no resistance; hence, it does not irritate the gastric mucosa. Blood in the gastric contents, if present, will, therefore, point to some organic condition. (2) By its use a moderate degree of gastric stasis will be readily detected. (3) It may be kept in the stomach as long as desired. (4) It lessens preparation and renders assistance unnecessary in lavage and in extraction of test-meals. (5)



Fig. 4.—Introduction of the modified stomach-tube and improved duodenal tube (Stage 2). Patient in sitting posture, the operator supporting the outer end of the tube, allowing it to move down the esophagus by gravity.

As its introduction causes no exhaustion, it may be employed in conditions in which the use of the ordinary stomach-tube is contraindicated. (6) In inflation of the stomach, effervescent powders generally are employed, which invariably produce overdistention and distortion, besides giving rise to epigastric distress. Following lavage or extraction of test-meals, an inflating bulb attached to the outer end of the tube will inflate the stomach to any desirable degree without any distress whatsoever. (7) Finally, it enables one to study the functions and disturbances of the stomach more readily and more accurately.

*This was found true by giving patients, on a fasting stomach, three slices of bread to eat, and one glass of water, removed at once, measured, and followed by a stomach-wash, the water running clear. The quantity recovered, equaled that ingested within the limits of 5 to 15 c. cm.

Contraindications.—(1) In emergencies requiring rapid action.

(2) Whenever the cooperation of the patient cannot be secured, as in a state of unconsciousness, or in exceedingly nervous patients, or when he struggles during the introduction of the stomach-tube.

Aspiration of Test-Meals.—In the employment of the old stomach-tube, the obtaining of gastric contents after its introduction is a passive process, as it is brought about by regurgitation induced by the contraction of the diaphragm and musculature of the stomach caused by the irritation of the tube. It is necessary to aspirate only after the tube becomes clogged by poorly digested food or



Fig. 5.

- (A) Author's test-meal aspirating glass bulb.
 - (a) Inlet of the gastric contents.
 - (b) Outlet for air.
 - (c) Outlet for gastric contents.
 - (d) Gastric end.
 - (e) Suction end by means of a suction bulb.
- (B) Illustrating the suction power of the glass bulb.
 - (a) Vessel of water representing the stomach and gastric contents.
 - (b) Modified stomach-tube attached to the gastric end of (c).
 - (c) Vacuum bulb aspirating about 3 oz. at a time at a height of 2 ft. from (a).

mucus. This process, whether passive or active, possesses the disadvantage that the gastric contents, in the passage from the floor of the stomach to the lips, a distance of 50 cm., assumes an uphill direction—against gravity, the patient being in a sitting posture. In the use of the modified stomach-tube, the irritation having been minimized, there is, therefore, no diaphragmatic contraction, and hence no regurgitation takes place. The obtaining of gastric contents, therefore, depends upon aspiration only, which may be performed by the author's high and low vacuum glass bulb (Fig. 5 A).

It is a graduated 10 oz. glass bulb, having an inlet A for gastric contents and outlets B and C for air and gastric contents, respectively, each of these being opened and closed by stop-cocks. It is attached to the outer end of the stomach-tube after its introduction, and a suction bulb at E will now aspirate the gastric contents into the glass bulb, provided C is closed and A and B are left open. When filled to its capacity the gastric contents in the glass bulb can be emptied through C into a receiving vessel. It can be used either with low or high suction power or alternately. In the former case, the cock A is left unclosed during the manipulation with the suction bulb at E. With each suction about 10 to 15 c. cm. of gastric contents are aspirated into the glass bulb.



Fig. 6.—Aspiration of gastric contents. Patient on the right side, mouth open, head slightly elevated and forward. Operator, sitting in front of the patient, manipulates stop-cock of vacuum bulb during the aspiration of test-meal.

In the high suction method, A and C are closed and the air in the glass bulb is rarified through B with the suction bulb or mouth, using a clean mouthpiece. On opening A the gastric contents then will flow into the glass bulb, 2, 3, or 4 oz. at a time (Fig. 5 B). A groove in stop-cock A is so situated that when the latter is closed the groove communicates with the gastric end of the bulb, and the stomach-tube, thus serving as an inlet for air, distends the tube when it is collapsed, due to obstruction by large particles of food during aspiration. The stop-cock A is then closed. The vacuum within the bulb is thus preserved while the influx of air through the groove distends the tube, after which the process of aspiration is continued. The chief advantages of this glass bulb are that it pre-

vents the soiling of the clothes and bedding, lessens preparation, renders assistance unnecessary in extraction of test-meals, and in lavage, when performed at the bedside or at the home of the patient.

Lavage.—This very important therapeutic measure, in primary

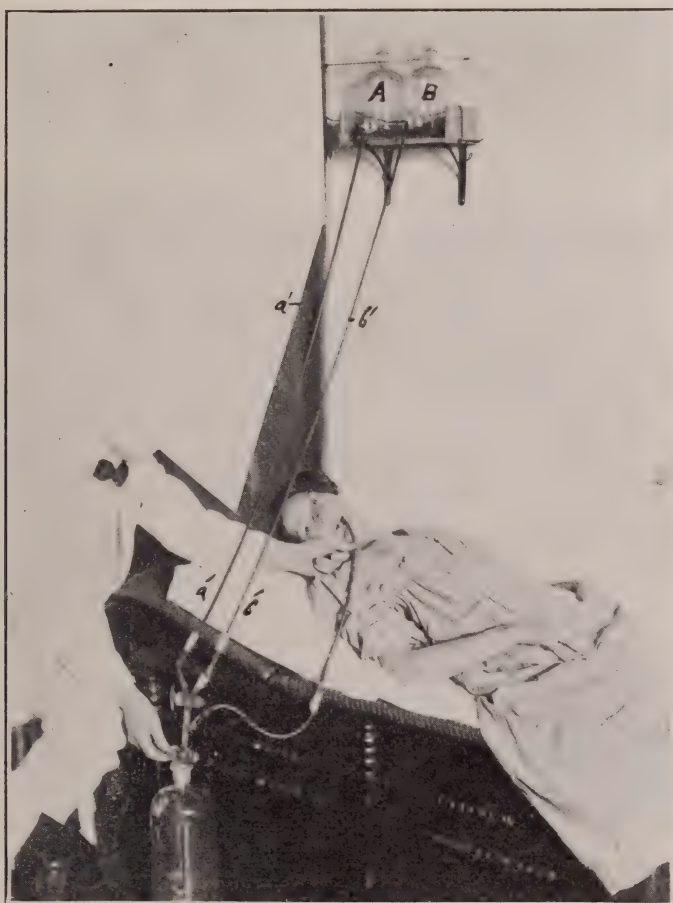


Fig 7.—Lavage.

(A) and (B)—Irrigating jars; solutions flowing through tubing (a') and (b'), double stop-cock piece and stomach-tube into the stomach. Patient lying flat undraped. Operator manipulates stop-cock with one hand while holding stomach-tube with the other.

and secondary affections of the gastro-intestinal canal, is held in low estimation by a good many physicians. This lack of confidence, the writer believes, was brought about by its misuse; for lavage, as ordinarily performed, is certainly no pleasant task to the operator, nor occasion of comfort to the patient. The mere sight of the preparation—the basin of cold water containing the stomach-tube, the funnel, the pitcher of alkaline solution, the draping of the

patient, and the operator clad in his gown—tends to usher, in the patient, feelings of fear and disgust. Furthermore, the return flow, being against the force of gravity, fails to remove much of the mucus and undigested food-remains from the stomach. Finally, owing to the discomfort experienced by the patient, lavage is usually performed rapidly, clumsily and hence often ineffectively.

The procedure practised by the writer is devoid of almost all the disadvantages stated above.* It consists of the application of the modified tube in conjunction with a double glass stop-cock piece. By referring to Fig. 7 the reader will note two graduated irrigating jars A and B placed about 3 ft. above the patient,

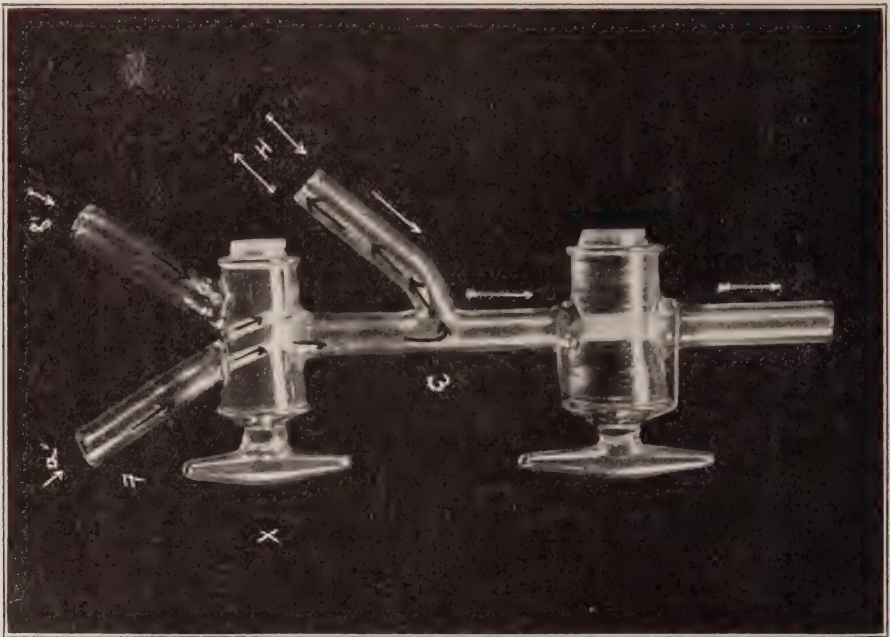


Fig. 8.—Author's double cock piece for lavage. Double-bored stop-cock communicating with tubing (a') and (b'). Large single-bored stop-cock allowing the passage of the return flow from the stomach.

each of 1,000 c.cm. capacity, with outlets at the bottom; A contains an alkaline irrigating solution and B a stimulating one, such as silver nitrate 1:10,000, potassium permanganate 1:5,000, etc. Two lengths of rubber tubing a' and b' are suspended from cocks of the irrigating jars A and B respectively, the lower ends of which reach about one foot below the level of the patient when in recumbent posture and are connected to a double cock glass piece. The upper stop-cock is double-bored so that it may form or sever the communication with either or both tubings a' and b'. The

*Palefski: Modified Method of Lavage. (*Med. Record*, January 10th, 1914.)

lower stop-cock has a large bore $5/6$ in., allowing the free passage of mucus and large particles of undigested food. The double cock piece communicates with the stomach-tube by means of tubing 1 ft. long. The irrigating jars, tubing and the double-cock glass piece are permanently fastened to one another by means of adhesive plaster, and can be easily carried from ward to ward in a box or basket, or fixed on a shelf as the case might be (Fig. 7).

Procedure.—The irrigating jars are filled with their respective solution. The modified stomach-tube is introduced in the manner as described above, after which the patient assumes the recumbent posture. The operator connects the double-cock piece with the stomach-tube, supporting the latter with the right hand and manipulating the stop-cocks with the left. On closing the lower stop-cock and opening the upper, the alkaline solution in A and B will flow through into the stomach (Fig. 7). The operator takes the reading on the jar, and when a quantity of 300 c.cm. has thus passed through, he closes the upper cock. As the modified stomach-tube can be retained a considerable length of time without any distress to the patient, the water therefore is left in the stomach for a few minutes, during which time the patient turns himself from side to side, thus allowing the thorough bathing of the whole gastric mucosa. Then on opening the lower cock the return flow will start by means of siphoning into some receptacle on the floor. This is repeated a few times in a single lavage beginning with the alkaline solution and ending with the stimulating one in the bottles A and B respectively.

The double-cock glass piece is time-saving, lessens work, and renders assistance unnecessary. The patient need not be draped, as he neither gags, coughs, nor vomits, but lies quietly in the recumbent posture, in which position the return flow assumes no up-hill direction, and hence mucus or large particles of undigested food pass out readily. The stream of the water running into the stomach can be easily regulated by the stop-cock—highly desirable in an easily irritable stomach. A lavage by this method is least discomforting and most effective.

Duodenal Intubation.—Within the last thirty years duodenal intubation has occupied the minds of a good many men, among them being Tuerck, Khun, Hemmeter. Each unsuccessful attempt brought us a step nearer the solution of this problem. However, it was Gross and Einhorn, who gave us the practical means of acquisition of the hitherto inaccessible duodenum by means of the duodenal tube. In its short existence it has been accredited with having thrown open new fields in the diagnosis and treatment of some pathological conditions of the duodenum, liver, gall-bladder, and pancreas.

At this juncture a few introductory remarks, regarding the oper-

ator, patient and instruments concerned in duodenal examination, will not be amiss.

Operator.—Duodenal intubation essentially is a skilful task. It requires the knowledge of a few cardinal rules to overcome the difficulties commonly encountered during this procedure, and it should, therefore, be performed by an experienced hand. Failures to recognize this point will help to discredit this long-sought method of examination. An institution should have someone in charge of this line of work who will teach others the correct technique.

Patients.—Unlike the examination of the stomach, not every patient is suitable for duodenal examination. Owing to the length of time this procedure requires, the co-operation of the patient is absolutely necessary. Hence, in the old, debilitated, restless, and in the unintelligent, and in children, duodenal examination is unsatisfactory.

Instruments.—A number of duodenal tubes have been described including the original by Gross and Einhorn, the merits of which can be judged only by how much each tends to facilitate and lessen the time and discomfort of a duodenal examination. A duodenal tube will best perform its task when it complies with the following conditions:—

(a) Immediately after its introduction, the ball of the tube, by means of gravity, aided by right-sided posture, must reach the pylorus.

(b) The diameters of the ball must correspond to the diameters of the pylorus. On its way toward the duodenum, the ball of the tube bears the same relationship to the pylorus, as presenting part of the fetal mass to the pelvis during parturition—namely, that the largest diameter of one must be in relation to those of the other to allow ready admittance into duodenum.

(c) When beyond the pylorus, the ball must be capable of passing through the horseshoe-shaped duodenum, or reaching the ampulla of Vater within the least possible time.

(d) During its use, the discomfort of the patient should be little, if any. The relative merits of only three duodenal tubes will be considered by the writer in this communication.

Gross's Duodenal Tube.—It consists of a No. 20 French soft tubing, enclosing at one end a perforated and calibered lead ball weighing 160 gr., of the size of a small cherry. The patient swallows the lead ball which reaches the pylorus in a few minutes and the duodenum from two to four hours. However, owing to its bulkiness, many patients refuse to swallow it, and, for the same reason, the pylorus of many patients will not admit it.

Einhorn's Duodenal Tube (Figs. 9 B, 10 and 11).—It consists of No. 8 French tubing, to one end of which is attached a perforated brass capsule weighing 48 gr. The patient swallows the cap-

sule, and, with the aid of a few mouthfuls of water it reaches the floor of the stomach at A (Fig. 10). From this point on, owing to its lightness, its passage into the duodenum depends upon peristalsis, but it is hindered by the coils of the tubing in the stomach. At the pylorus, the elongated capsule must undergo rotation by the peristalsis in order to bring its long axis at right angles to the former (Fig. 10). These features prolong its stay in the stomach, and not infrequently it is regurgitated after a considerable length of time.

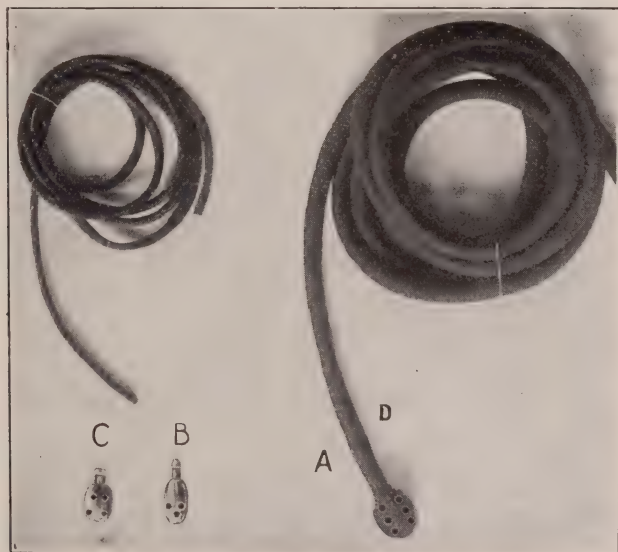


Fig. 9.—Weights of three duodenal tubes.

(A) Gross's bulky duodenal tube.

(B) Einhorn's light and elongated capsule.

(C) The short gold-plated lead ball of the author's improved duodenal tube.

(D) Tubing to (B) and (C).

Very often a loop of tubing precedes and enters the duodenum while the capsule remains in the stomach entangled among the coils of the tubing (Fig. 11). This is responsible for the many unsuccessful attempts. An examination by its means is time consuming, requiring from five to twelve hours, and hence it is usually passed and left over night—a source of great discomfort, which is not tolerated by many patients.

The Author's Improved Duodenal Tube (Figs. 9 C and 12).*—Its design and perfection are based upon a previous experience of several hundreds of examinations by the writer after having

*New and Improved Duodenal Instruments. (*New York Med. Journ.*, October 18th, 1913.)

familiarized himself with the disadvantages of both original tubes, and after an experimental study of the relative effects of various shapes, sizes and weights of the ball of the duodenal tube toward a speedy duodenal intubation. It consists of No. 8 French pure rubber tubing, to one end of which is attached a perforated gold-plated lead ball weighing 105 gr. (Fig. 12). The tube is marked off at 40, 50, 60 and 70 cm. distance from the ball. The following table shows the features of each of the three duodenal tubes:—

It will thus be observed that the improved duodenal tube is twice as heavy, and its long axis is less than one-half that of the

	Gross's.	Einhorn's.	Author's.
Substance and design	Perforated and calibrated lead ball covered with tubing*	Perforated brass capsule	Perforated and gold-plated lead ball
Weight in grains	160	48*	105
Long axis of the weight	$\frac{5}{8}$ in.*	$\frac{7}{8}$ in.*	$\frac{3}{8}$ in.
Size of tubing...	No. 20 French*	No. 8 French	No. 8 French
Swallowed	With difficulty*	With the aid of water*	Easily
Reaches pylorus	In a few minutes by the aid of gravity	Indefinite; after many hours by the aid of peristalsis*	In a few minutes by the aid of gravity
Reaches ampulla of Vater...	In 2 to 4 hours	5 to 12 hours*	1 to 2 hours
*Disadvantages.			

capsule of Einhorn's duodenal tube. It is, therefore, easier swallowed, and by the aid of gravity it reaches the pylorus in a few minutes, and gradually makes its way into the duodenum in from one to two hours.

Method of Introduction.—Its passage to the pylorus is accomplished in the same three procedures as described above by the introduction of the modified stomach-tube. It is best passed on an empty stomach, usually at 9 a. m. First, the patient places himself in a recumbent posture with his mouth wide open. The operator introduces the perforated gold-plated ball directly into the pharynx; the patient then swallows it and assumes the erect posture.

Secondly, the patient now breathes deeply and slowly while the operator is supporting the outer end of the tube. The latter will be seen to move into the mouth until the 35 cm. mark has ap-

proached the lips indicating that the ball has reached the cardia. During its passage through the esophagus, the weight of the ball should be felt by slightly pulling on the tube. This sense of resistance is absent when the onward passage of the ball is stopped by the anatomical constrictions of the esophagus.

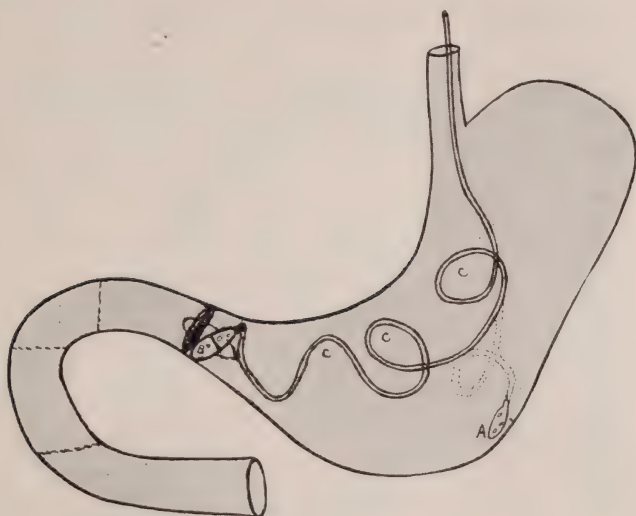


Fig. 10.—Einhorn's duodenal tube in the stomach.

- (A) Where capsule reaches the stomach.
- (B) The capsule undergoing rotation at the pylorus.
- (C) Coils of tubing hindering its passage toward the pylorus.

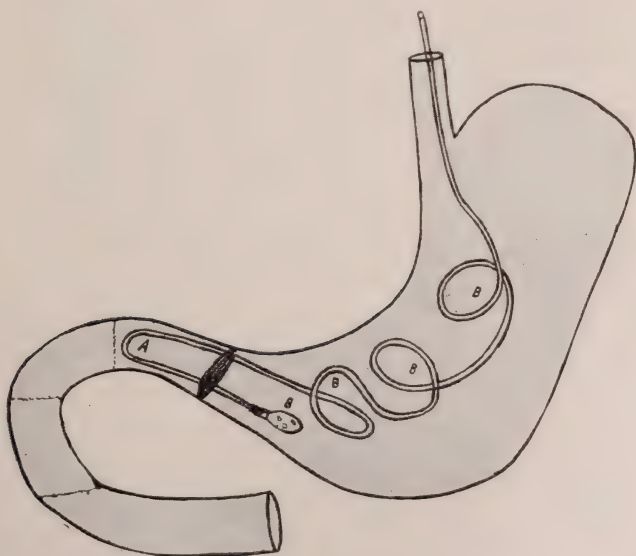


Fig. 11.—Einhorn's duodenal tube in the stomach.

- (A) Loop of tubing entering the duodenum.
- (B) Capsule caught among the coils of tubing in the stomach.

Thirdly, the patient places himself on his right side and the tube is allowed to go into the mouth until the 50 cm. mark slowly approaches the lips. At this point the ball of the duodenal tube passes along the lesser curvature and gravitates toward the pylorus along with the scanty quantity of gastric contents present in the empty or fasting stomach (Fig. 13). To ascertain whether or not the tube has been correctly introduced, the operator aspirates a speci-

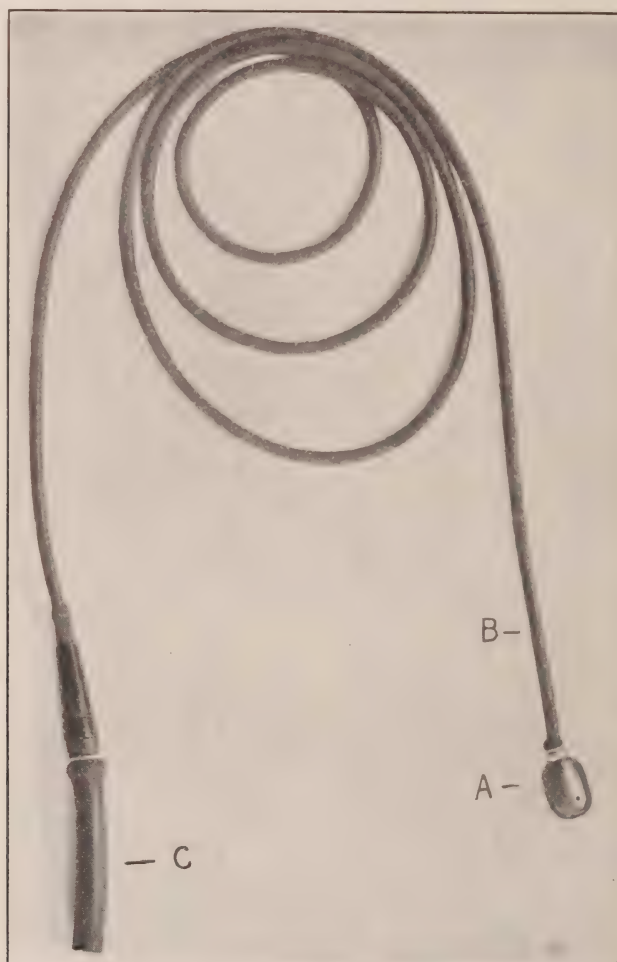


Fig. 12.—Author's duodenal tube.

men of gastric contents by means of the author's aspirating duodenal glass bulb (Fig. 14) which will be readily obtained provided the ball has reached the pylorus. When no gastric juice is obtained, the tube is withdrawn about 5 to 10 cm. and then reintroduced, after which aspiration is again attempted until some fluid is invariably obtained. The important points to be remembered during the introduction of the tube are:—

(a) The tube should not be introduced further than to the 35 cm. mark before the patient places himself on the right side.

(b) If introduced further than the 55 cm. mark there may occur a condition as shown in Fig. 11.

(c) A specimen of the gastric contents must be aspirated immediately after the introduction of the tube, while the patient lies on the right side to ascertain whether or not the duodenal tube has reached the pylorus.

Rehfuss, of Philadelphia, in a recent communication,* suggested an improvement in the author's duodenal tube by making the ball slotted instead of perforated, claiming that in such a form it may

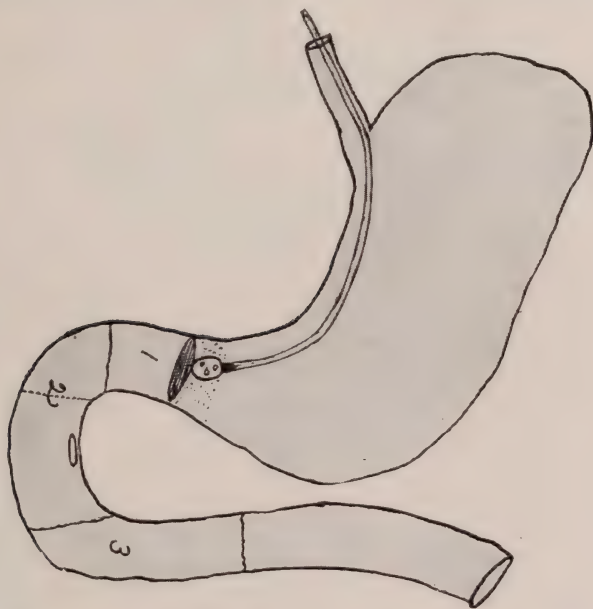


Fig. 13.—The introduction of the improved duodenal tube, showing tube along the lesser curvature, lead ball and gastric contents at pylorus. (Patient on right side.)

also be used as a stomach-tube. That it is unnecessary as a stomach-tube is evident from the fact that gastric contents can be aspirated with the improved duodenal tube, which was emphasized by the writer in his original article. He also employs the improved duodenal tube in the extraction of test-meals from highly nervous patients, owing to its easy introduction.

A slotted duodenal tube, as he suggests, is extremely objectionable. It is bulky, 7-8 in. long, and patients, therefore, refuse to swallow it. Secondly, the slotted form lacks the advantages of the perforated ball of the writer's duodenal tube, which acts as a sieve, allowing the aspiration of only liquids, leaving behind large

**Amer. Journ. Med. Sciences*, June, 1914.

particles of food, or mucus, and thus preventing the clogging of the tube. It also does not allow the aspiration of the duodenal mucosa, as it should be remembered that the contents in the duodenum are scanty and more difficult of aspiration than gastric contents, and the ball is in greater contact with the delicate mucosa of the duodenum.

The Gastroduodenal Tube.—The findings in a duodenal examination, at times, can hardly be accurately interpreted unless accompanied by a simultaneous examination of the existing conditions in the stomach. Indeed, in certain cases, a duodenal examination, independent of an examination of the stomach, might lead to errors. Furthermore, when pathological constituents are present

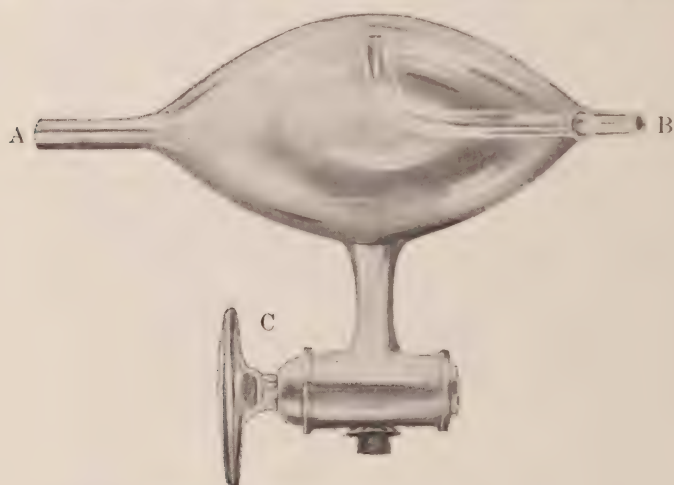


Fig. 14.—Author's duodenal aspirating glass bulb.

- (A) Duodenal end—inlet for duodenal contents.
- (B) Suction end.
- (C) Outlet.

in the duodenal contents, as blood or pus, the question naturally arises as to their source, as these might have been conveyed into the duodenum by the gastric contents. Finally, it was our aim to undertake a series of simultaneous investigations in the gastric and duodenal digestion. We have accomplished all these by means of the author's gastroduodenal tube (Fig. 15).

Construction.—It is a noncommunicating, double-channeled tube, one leading into the stomach and the other into the duodenum, for the purpose of obtaining simultaneously unmixed gastric and duodenal contents. It consists of two lengths of No. 8 French pure gum tubing, 60 cm. long, placed side by side, covered and held in position by a thin drainage tube. The gastric end of each tube is attached to and communicates with a double bored aluminum piece of 5 gr. weight—one terminating as a free opening, forming a

point of communication with the stomach. The other bore, $\frac{1}{4}$ in. longer, allows attachment and communicates with a 9 in. No. 8 French tubing, holding in suspension at the other end a gold-plated, perforated lead ball similar to the one described in connection with the duodenal tube. The distance between the aluminum piece and

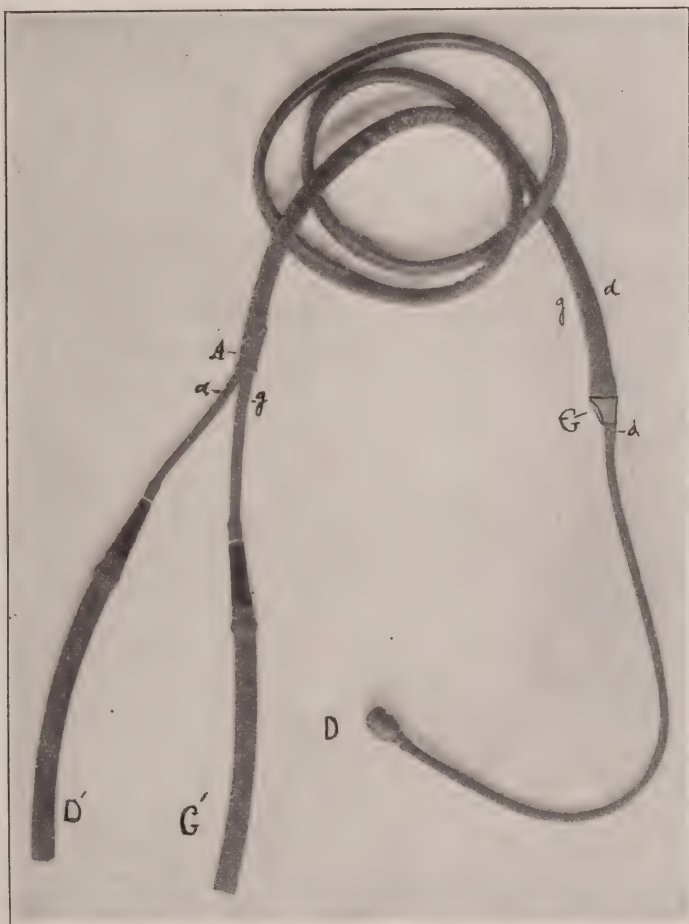


Fig. 15.—Author's gastroduodenal tubes.

- (D) Duodenal inlet beginning in the perforated ball.
- (G) Gastric inlet.
- (d) and (g) Gastric and duodenal tubes covered by (A).
- (A) Drainage tube.
- (C) Aluminum piece with double bore (g) and (d).

the lead ball equals that between the pylorus and the third portion of the duodenum. The outer ends of tubing d and g are free and separate. The perfection of this tube lies in the fact that it is swallowed, introduced, and retained as readily as the duodenal tube.

Technique.—The mode of introduction is the same as that of the duodenal tube. Immediately after its introduction, the perforated lead ball lies at the pylorus, while the aluminum piece, containing the gastric inlet, is up in the fundus. On aspiration then, gastric contents will be obtained from tube d and nothing from tube g. As the lead ball gradually makes its way into the duodenum, in from one to two hours, it will bring down the aluminum piece toward the pylorus, when unmixed gastric and duodenal contents simultaneously will be obtained on aspiration at d and g respectively. The operator now introduces, with a finger syringe, directly into the duodenum, or stomach, as desired, liquid foods, as milk, white of egg, soup, or medicinal agents, and removes specimens for subsequent examination.

Evidence Showing the Duodenal Tube to be in Duodenum.—During the examination, very often, it is necessary to locate the ball of the tube in the duodenal tract, especially, is this desirable when an x-ray of the duodenum is to be taken by the method the writer has outlined.* The 'retraction sign' and 'sense of resistance,' so much emphasized by others, are of little value, inasmuch as the same will be experienced when the ball of the duodenal tube is in the grasp of the pylorus, and the tube itself is coiled up in the stomach. The writer, therefore, employs the following three methods:—

(a) Aspiration of a specimen of clear neutral, and bile-colored duodenal contents, following a previously aspirated specimen of colorless free hydrochloric-acid contents, is positive evidence that the duodenal tube is in the duodenum, as a specimen of regurgitated duodenal contents is almost always turbid and usually acid in reaction, free hydrochloric acid being present.

(b) Upon inflating with a bulb attached to the outer end of the duodenal tube, if the latter is still in the stomach, the epigastrium will become distended and tympanitic, and the patient will experience discomfort followed by immediate belching. On the other hand, if the tube is in the third portion of the duodenum or beyond this point, the lower abdominal quadrants will become distended and tympanitic; the epigastrium will become depressed and the patient will neither belch nor experience any discomfort whatsoever.

(c) Auscultation while inflating will elicit sounds characteristic to each of the viscus. If the tube is still in the stomach, on auscultation over the epigastrium the sounds will be of a loud, gurgling quality, as gr-r-r. If the tube is in the duodenum, on the other hand, the sounds will possess a distant hissing quality as ss-ss-ss, more distinct on auscultation over the right hypochondrium.

Uses of the Duodenal Tube.—As stated above quite a number of

*Visualization of the Duodenum. (*Med. Record*, April 18th, 1914.)

functions have already been ascribed to it, and if only part of these be found practical, it has already fulfilled its expectations. However, the following may be regarded favorably:—

(a) That the duodenal tube furnishes the best means of procedure in ascertaining the functional activity of the pancreas by examining a fresh specimen of duodenal contents for pancreatic enzymes. A number of communications on this subject have appeared within the last few years, with conflicting conclusions owing to the complicated tests the authors have employed without any preliminary investigations introductory to a new subject. The writer has performed many hundreds of duodenal examinations, the results of which will be published in the near future.

(b) *Localization of Lesion in the Gastro-Duodenal Tract.*—This can best be performed with the author's duodenal tube, by watching its progress from the pylorus toward the jejunum, and by noting the color and reaction of aspirated contents. Fig. 13 shows the duodenum divided into its three anatomical parts, first, second and third. The following table shows the distance, location of the duodenal tube, and the characteristics of the aspirations at the end of each half-hour, in the first two hours after the introduction of the duodenal tube:—

	One-half hour.	One hour.	One and a half hours.	Two hours.
Distance from lips	50 cm.	55 cm.	55 to 60 cm.	60 to 65 cm.
Color of aspirated contents	Colorless	Colorless or light greenish turbid	Golden, yellowish green	Golden, yellowish green
Consistency	Mucoid	Watery	Viscid	Viscid
Reaction	Free hydrochloric acid +	Neutral or free hydrochloric acid +	Neutral to litmus	Neutral to litmus
Location of the duodenal tube...	Beyond the pylorus	First or second portions of the duodenum	Second or third portions of the duodenum.	Third portion of the duodenum.

A knowledge of these normal findings will enable one to localize a lesion in the gastroduodenal tract by examining each of the specimens for blood, mucus, and enzymes.

(c) Duodenal alimentation in gastric and pyloric lesions causing great pain, vomiting, including gastric neurosis.

(d) Local treatment of duodenal ulcers, duodenitis, and catarrhal jaundice, the method of which is yet to be perfected.

(e) Suction of the common bile duct in the impairment of the flow of bile when such is not due to obstruction by gall-stones.

(f) Intestinal therapeutics, the nature and method of which are yet to be established.

(g) Author's method of visualization of the course and shape of the duodenum by means of Roentgen rays in conjunction with the use of the improved duodenal tube, following the aspiration of typical duodenal contents in the investigations of lesions in this

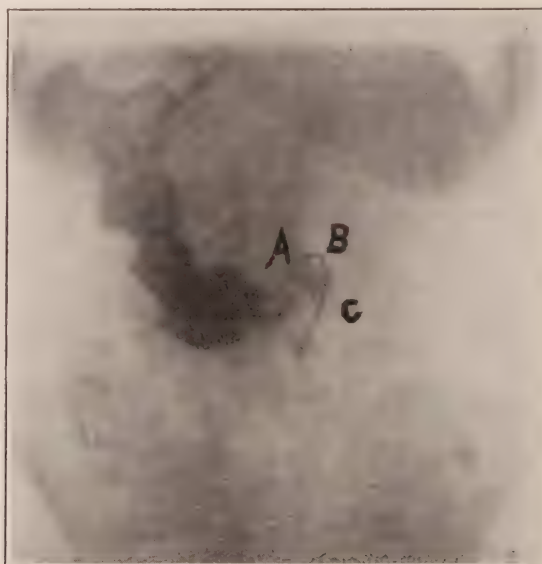


Fig. 16.—The duodenal tube at the ampulla of Vater.

(A) First portion of duodenum.

(B) Curve formed by the junction of first and second portions of the duodenum.

(C) Second portion of duodenum; the stomach filled with bismuth shows deformity in the larger curvature; duodenum unaffected.

part of the alimentary tract when their presence cannot be detected by the well-established methods. It must be remembered that *x*-ray investigations of the upper intestinal tract, for diagnostic purposes, are not always satisfactory, owing to the fact that this part of the intestinal canal is insufficiently filled with impervious substance, at any given time, to show its course, shape, and size upon an *x*-ray plate. Hence, the fluoroscope, enabling the direct examination, but also not quite satisfactory, is resorted to by the investigator. The course of the duodenum and the commencing jejunum may be made visible by filling the duodenal tube with a sus-

pension of bismuth made as follows: Thoroughly stir up with a glass rod, for a few minutes, about $\frac{1}{2}$ oz. bismuth into 3 oz. milk to a fine suspension. Strain the latter through a funnel and gauze to exclude coarse and undissolved particles of bismuth. Then fill a 15 c. cm. glass syringe, terminating into a point, with the strained suspension, and inject the latter into the duodenal tube following the aspiration of duodenal contents, until a resistance is felt, usually after the injection of about 10 c. cm. The distal end of the tube, then, is clamped to prevent the escape of the bismuth. The patient



Fig. 17.—The duodenal tube outlining the course of the normal duodenum and the commencing jejunum.

- (D) Larger curvature of the stomach.
- (E) Course of jejunum.
- (F) Umbilicus.
- (G) Duodenal tube along lesser curvature.

now drinks about a glass of milk containing an ounce of suspended bismuth by mouth. This is necessary in order to differentiate the stomach from the duodenum. The exposure is then made with the abdomen in apposition with the film side of the x -ray plate, in a standing posture whenever possible. The duodenal tube then is removed and cleansed.

In Fig. 16 the duodenal tube outlines the normal course of the duodenum, A and C representing the first and second portions respectively. The smooth curve B, formed by the junction of the

first and second portions of the duodenum is especially to be noted. When this is intact the improved duodenal tube will reach A within a period of one hour, and, on aspiration, watery, colorless or slightly greenish, neutral or faintly acid contents will be obtained. It reaches C, or the ampulla of Vater, within a period of one and one-half to two hours, as evidenced by the aspiration of golden, greenish, clear, neutral, bile-colored contents.

Figs. 17 and 18.—Here the duodenal tube outlines the normal



Fig. 18.—The duodenal tube outlining the course of the normal duodenum and the commencing jejunum.

- (D) Larger curvature of the stomach.
- (E) Course of jejunum.
- (F) Umbilicus.
- (G) Duodenal tube along lesser curvature.

course of the duodenum as well as that of the commencing jejunum. The relationship between the latter and the larger curvature of the stomach, particularly, is to be noted—namely, that the one is seen below and along the other.

Fig. 19.—The duodenal tube outlines the course of the duodenum and the commencing jejunum in a case of a duodenal ulcer with adhesions between the duodenum, jejunum and the posterior surface of the stomach. The curve formed by the junction of the first and second portions of the duodenum, seen in Fig. 16, is represented

by the sharp angle B. The commencing jejunum is not seen running below the larger curvature, but is hidden high behind the posterior surface of the stomach, coming into view at D. In this case, the duodenal tube has reached the Ampulla of Vater after twenty-six hours, during which time it aspirated gastroduodenal contents, turbid, acid reaction, containing occult blood. The writer termed this delayed passage 'duodenal-tube obstruction,' in view of the fact that the *x*-ray examination six hours after a bismuth test-meal revealed no gastric stasis or obstruction, the stomach having been

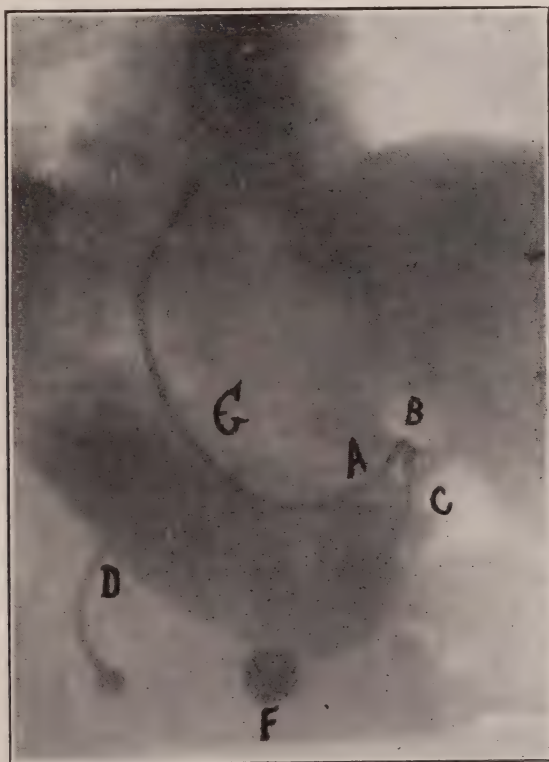


Fig. 19.—Duodenal tube outlining the course of the duodenum and commencing jejunum in a case of perforated duodenal ulcer, (A) and (C) meeting at an angle. (B) is drawn up to the fundus of the gall-bladder. The jejunum is adherent behind the posterior surface of the stomach as far as (D).

(G) Duodenal tube along lesser curvature.

(F) Umbilicus.

found normal in its shape and size. It is explained that in this case the ball was caught in the angle formed by the first and second portions of duodenum and is lodged for many hours. Further experiences on the subject of visualization of the duodenum in various duodenal lesions will be published in the near future.

The chief aim of this lengthy paper is to point out the shortcomings of the old methods of examination of the gastric duodenal tract, and to emphasize the necessary skill and precautions required in the employment of the new and modified instruments, the application of which not only facilitates the examination, but will also, the writer feels certain, augment our knowledge in gastroenterology.

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THE DIAGNOSIS OF ESOPHAGEAL DISEASES.

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It is rather peculiar that the esophagus is not more frequently affected by the numerous pathological conditions encountered in the other organs. It has been demonstrated that many gastric disturbances are caused by such indiscretions in the dietary as alcohol, very hot or very cold fluids, sharp spices, tobacco, etc. As these substances come into close and intimate contact with the esophageal walls long before reaching the stomach, it would be but logical to argue that any deleterious influence, if at all exercised, would be exerted chiefly, if not primarily, upon such esophageal membrane. Such an assumption, while logical enough, is completely out of harmony with known facts, for gastric disease is far more common than esophageal. The comparative immunity of the esophagus may perhaps be best explained by the short contact between irritating foods and the esophageal wall. Under abnormal conditions, however, when from some cause or other the act of deglutition is protracted, irritating substances do cause injury to the esophageal walls, not infrequently very serious in character.

The comparative rarity of external traumatism, which etiologically plays such an important rôle in the diseases of other organs, may be another contributing factor accounting for the smaller number of esophageal affections. The distance of the esophagus from the anterior and lateral walls of the thorax and the position of the organ behind the strong bony tissues of the spine seem to guard the esophagus against external attack. On the other hand, injuries sustained within are more frequent with this organ than with the other hollow viscera of the gastro-intestinal tract. Such injuries are not limited to those produced in children by the swallowing of foreign bodies, but include numerous cases of corrosion of the esophagus caused by poisons and caustics oftentimes taken with suicidal intent. In addition, in the case of adults, the improper introduction of the stomach tube or other instruments by the inexperienced, the deglutition of large, dry, unmasticated morsels of food, the ingestion of irritating substances and also the swallowing of false teeth, bones or other foreign bodies are not uncommon.

The anatomical construction of the organ may constitute another reason for the infrequency of esophageal diseases. Its heavy protective layer of squamous epithelium, its poor blood and nerve supply, the scarcity of lymph follicles and mucous glands, all favor the organ greatly against ravages of disease. Besides, the number of esophageal cases is apparently still further reduced because they are frequently overlooked. Quite a number of early lesions are missed because the subjective symptoms they occasion are often mild and therefore disregarded. This is particularly true in the case of young women in whom such complaints as difficulty in swallowing or even discomfort or pressure behind the sternum are wrongly diagnosed as *globus hystericus*. And yet the above-mentioned complaints are not infrequently the early manifestations of serious disease, such as ulcer, stenosis or even carcinoma.

Even though the variety of diseases affecting the esophagus is not very large, nevertheless their differential diagnosis is often very difficult. The inaccessibility of the organ to examination from without, the inapplicability of the ordinary methods of examination of other organs, and the limitations of the symptomatology are causes of the above-mentioned difficulty. If diagnosed early, a great number of pathological conditions of the esophagus are either completely curable or more or less amenable to treatment. It is of the utmost importance, in classifying the cases therapeutically—those of a still hopeful character from those non-amenable to treatment—not to neglect any information, subjective or objective, leading to correct conclusions, as the life and future of the individual depend upon the correctness of our diagnosis. This statement particularly applies to the most frequent affection, stenosis carcinomatosa. If recognized at an early period, and because of the marked advances latterly made in thoracic surgery, strong hopes may be held out to the patient; if not recognized in time the patient usually succumbs in a very few months.

DIAGNOSTIC METHODS.

The esophagus has not received as much attention and study as the stomach and intestines. The methods of its examination are few, and some of these are either very unsatisfactory or else limited to those practitioners possessed of special training. Only since the introduction of the Roentgen ray methods of examination, which has become such an invaluable diagnostic factor for all organs, has appreciable progress been made in the diagnosis of esophageal disease. In the writer's opinion, the roentgen examination should be accorded the greatest prominence. To the experienced examiner the method is simple and convenient, and, what is of even greater importance, it entails practically no discomfort to the patient. The readings are scientifically exact and, as a rule, absolute. When

compared with the next approach to an exact method of examination—the esophagoscope—the roentgen method has incomparable advantages. Only one need be pointed out here. *It is devoid of danger*—a factor which cannot be disregarded especially when considering the age of the patients in whom esophageal disease is most common, *i. e.*, elderly individuals with hardened vascular systems.

Radioscopy.—It would be beyond the scope of this paper to go into the details of an *x-ray* examination of the esophagus, but it seems necessary to emphasize the necessity of proper technique. This particularly applies to the method of administration of the bismuth while fluoroscoping the esophagus. Every method has some advantages under certain conditions. The writer has tried most of them—the capsules, the water mixture, potato mixture, mandarin combination, marmalade and gelatine, etc., but finds the incorporation of bismuth with mucilago acacia, as practised by Hirsch, of New York, to be the most serviceable. It gives most satisfactory results in all cases under various circumstances, and eliminates the necessity of plugging the cardia as claimed by others, for which purpose Bassler devised a method.

Fluoroscopy is especially valuable. By it we may trace the morsel of bismuth from the moment of its arrival into the esophagus until its departure through the cardia; we may observe peristaltic movements, whether normal or abnormal; we may follow the curves of the gullet whether natural or unusual; we may detect obstructions, constrictions, dilatations, diverticulæ; we may observe spasms, regurgitations, antiperistaltic waves and numerous other irregularities of anatomical or physiological interest and diagnostic value. When the patient is placed in the left oblique position in front of the fluoroscopic apparatus, the esophagus normally appears as a streak of light bounded behind by the shadows of the spinal vertebræ and in front by that of the heart and vessels running parallel to the curvature of the spine and more or less uniform in width except at its normal places of constriction, such as at its origin, at the position of the arcus aortæ, and at the diaphragm. The passing of a hard metal sound, while fluoroscoping, facilitates the study of the normal anteroposterior and lateral curves of the esophagus and reveals any deviations that may be produced by any abnormalities. Radiography, lateral and posterior, proves definitely the presence of permanent obstructions and dilatations, locates the position of tumors and foreign bodies, and excludes or reveals the presence of numerous conditions affecting other organs of the neck and chest, which directly or indirectly influence the function and sensitiveness of the esophagus. In other words, an *x-ray* examination is not only of great help in direct diagnosis of the esophageal disturbances, but indirectly it is also the means of determining the etiological factor responsible for the

disturbances. Not only may it demonstrate directly the existence of a stenosis and its position, but it may also reveal the causative condition, such as a prominent arch of the aorta in arteriosclerotics, a displacement or enlargement of the heart, enlarged glands, a mediastinal tumor, etc.

The esophagoscope, as a means of diagnosis, has certain objections; considerable difficulty is inevitable with its use. Thus its introduction requires special dexterity, training and skill. It is accompanied by considerable discomfort if not actual pain to the patient, and finally, it is not devoid of danger. The capacity for observation by the esophagoscope is also limited. Its use is only of value in the study of local conditions, and not in the most important feature, the functioning of the organ. But it has also its special advantages. Next to the Roentgen it is the most valuable and instructive method of examination we possess. It permits direct inspection of the mucosa; it enables the detection and observation of ulcers and stenoses; it reveals the presence of foreign bodies, new growths, esophageal varicosities, etc., and what in some cases is of greatest value, permits also operative interference. Through the use of this instrument we are enabled (whether advisable or not is another question) to obtain small portions of suspicious tissues for microscopic diagnosis. We may also extract foreign bodies, we can make direct applications to wounds and ulcers, we are enabled definitely to establish the presence of diverticulæ, of spasms, etc. The use of the esophagoscope should be restricted to those of experience, and the introduction of this instrument exercised with greatest caution. The various commercial instruments have their advantages and disadvantages. Abroad the Gottstein, Mickulicz and Roesenheim instruments are in vogue, either with blunt or obliquely curved extremities. The introduction of the esophagoscope is accomplished with the patient in the sitting or horizontal posture. Personally, the writer prefers the latter. The operation is best performed in the morning, after thorough cocainization of all parts of the mouth and pharynx (fauces, epiglottis, pharynx, larynx, etc.) and only after preliminary sounding of the depth and width of the esophagus or of an existing stenosis.

Sounds.—The method of esophageal examination at once the most practical, most frequently used, and least objectionable, even if employed by the inexperienced, is the employment of bougies or sounds. The observations made by this method are based upon the sense of touch; hence they are less reliable than those obtained by the most acute of all senses, that of sight. When using sounds, these must be carefully selected. Their introduction is accomplished in the same manner as that of an ordinary stomach tube; the latter may frequently serve the purpose. The writer not infrequently uses a flattened, somewhat harder than usual, stomach tube,

having a firm non-perforated tip, the perforation being about an inch from the extremity. The sounding should begin with a solid bougie, of not too small calibre (10 to 12 mm.); thinner bougies may cause harm.

The introduction should be accomplished slowly, but firmly, directing the patient to swallow the tube. There must be no tendency to bore the instrument. When gagging is very strenuous and an effort is made to expel the sound, the latter should be retained firmly, but not roughly or forcibly. If permanent obstruction is encountered, its distance from the incisor teeth should be determined, remembering the normal distances from the teeth to the fixed landmarks (to the cardia—40 cm., to the bifurcation of the trachea—about 25 cm., to the origin of the esophagus—15 cm.). To measure the length of an obstruction Willy-Meyer recommends Schreiber's bougies, and for the determination of the diameter of a constriction—those of Callmann. If the sound is grasped and held firmly by the organ, permitting neither further introduction nor withdrawal, it usually indicates spasm. If the sound is permitted to pass without difficulty, while food is not—the case is then either a neurosis or constitutes an obstruction from without the esophagus. In diagnosis of diverticulæ the sound is often very valuable, by means of it some of the fluid contained in the pouch may be extracted and very valuable information thus secured for the establishment of a definite diagnosis.

As to the other methods of diagnosing esophageal disease, very little that is laudatory may be said. *Inspection* of the esophagus, exclusive of the esophagoscope method, is very limited and confined entirely to the uppermost portion, near the junction of this organ with the pharynx. Only in rare cases, such as new growths in the cervical portion, may the diagnosis be helped by such inspection. The same is true of *palpation*. This can only be applied in the most advanced cases of cervical tumors, when the latter may be so large as to push the esophagus, sufficiently superficial to become palpable; but the glands, cervical or supraclavicular, if involved, may be palpated much earlier. *Auscultation* is another indefinite method adopted. Personally, the writer could never satisfactorily differentiate abnormal from normal deglutition sounds. The abnormal swallowing sounds are to be determined to the left of the spine, at the tenth dorsal vertebra. The sounds are so unreliable that this method of examination may practically be disregarded.

SYMPTOMATOLOGY.

While we are in possession of meagre means to make a diagnosis from objective observations, we have a number of subjective symptoms which, when interpreted intelligently and added to those of our own observation, help us considerably in establishing a correct

formulation. Unfortunately the symptomatology of esophageal diseases is very limited. In practically every case, no matter what the pathological condition may be, the subjective complaints include dysphagia, regurgitation of food, vomiting, pressure in the sternal region, and pain. In view of their frequent repetition in every condition and their important bearing, it is perhaps justifiable to enumerate these symptoms and review briefly their relative merits in the diagnosis of the individual disturbances of the esophagus.

Dysphagia is the most frequent, the most prominent and the most distressing symptom. This complaint may be so mild as merely to constitute a slight inconvenience to the patient, or may be so severe as to make swallowing virtually impossible. It is independent of and not always proportional to the nature, extent or position of the lesion. It is consequent upon a break in the continuity of the nerve-muscle-path, by which the peristaltic wave normally travels and which continuity is essential for the correct coordination of the rhythmic acts during the process of deglutition. It may also be the result of the pathological lesion mechanically interfering with the normal procedures of an act of swallowing, thus making it impossible for the organ to contract firmly. The dysphagia may be of a progressive type, as in new growths, or remain arrested, *i. e.*, not increase in severity, as in benign conditions. The disturbance may also be transient or permanent. It is quite frequently the earliest symptom of such serious states as carcinoma, and may remain its only manifestation for some time. Hence dysphagia should not be disregarded or even underestimated, but should be given careful attention.

Pain, either constant or transient, is another fairly frequent symptom of esophageal disease. It is also an early one, and may range in intensity from a slight discomfort upon swallowing, such as a consciousness of the food passing through the gullet, to a sharp burning pain, either brief or prolonged. The pain is felt most commonly behind the manubrium sterni; also in the back between the shoulder blades. Its severity is often proportional to the size of the morsel and to the variety, consistency and sharpness of the food ingested. The pain may be excruciating, as the writer observed in a case of ulceration after lysol poisoning, or may have the milder character of boring, burning or even of dull pressure. Patients often endeavor to relieve themselves of the pain by pounding the chest or back. The pain is often more severe at night than during the day.

It must be borne in mind, that the esophagus, being but poorly supplied with sensory nerves, in itself does not cause as much pain when affected as do other organs. Hence when pain is a prominent complaint, it usually indicates the secondary involvement of the structures in close proximity. Under these circumstances, the pain

is not confined to the two places mentioned, but may be felt in the epigastrium, in the intercostal spaces, in the neck, in the various nerve trunks and in other places, depending upon the organ thus involved (the mediastinum, the nerve plexi, the pericardium, etc.).

Regurgitation of food and vomiting, either immediately after its ingestion or after longer intervals, is a characteristic symptom of a number of pathological as well as functional disturbances of the esophagus. This symptom oftentimes occurs very early and first attracts the attention of the patient and physician. The substance regurgitated varies in quantity from a few mouthfuls of a clear liquid in functional disturbances to large quantities of a foul smelling, dirty and decomposed substance containing tissue or food, as in cases of large diverticulæ. The regurgitation usually occurs a few minutes after the partaking of meals, but may also appear half an hour or later, depending upon several conditions, as (1) the consistency or irritability of the food ingested; (2) the local sensibility of the organ affected; (3) the size of the opening in stenosis of the esophagus when the vomiting is due to this condition; (4) the extent of dilatation and hypertrophy of the organ above the seat of obstruction; (5) size of diverticulæ, etc. etc. Vomiting may also appear periodically, especially in certain forms of diverticulæ.

It is important to differentiate vomiting from the stomach from that above the cardia, the esophagus. The fluid expelled from the latter source is alkaline in reaction, has no free hydrochloric or any other mineral acid, has no enzymes found in the stomach, such as pepsin and rennin. It differs in color and consistency from stomach fluid, usually contains particles of food either from the last meal ingested or not infrequently from previous meals. It is intermixed with considerable mucus, pus and blood corpuscles, numerous fungi, and in addition, it contains various sugars in the advanced stages of transformation. Vomiting or regurgitation occurs with stenoses, dilatations, obstructions, spastic contractions, following ulcerations, or idiopathic, antiperistalsis and other circumstances.

Spasms constitute another very frequent accompaniment of esophageal disease. They are strong contractions of the circular muscles at some part of the esophagus, usually at or about the seat of its lesion. Spasms form Nature's method of protecting such lesions whenever extraneous matters are irritating the diseased surface. Spasms occur principally in *ulcers* of the esophagus, but also in allied conditions. They may be of momentary duration, as during meals, or prolonged, as in severe pathological disturbances of the esophagus. In *stenosis* of the latter, spasms are intended to overcome the obstruction and thus to propel the food forward into the stomach. In ulcerative conditions their appearance is favored by the increased irritability of the nerve-muscle apparatus of the in-

volved organ. In *neurotic conditions*, spasms are present in various degrees of severity, usually inconsistent with the other symptoms present. Directing the patient to swallow several times in rapid succession will usually remove the spasms in such neurotic individuals. *Esophagismus* is a very common occurrence in young hysterical or hypochondriac individuals, particularly of the vagotonic type, a phenomenon for which Eppinger accounts by an increased irritability of the autonomous division of the vegetative system in these individuals.

Inanition is another symptom commonly, but not necessarily, accompanying the diseases of the esophagus. In some cases inanition becomes evident early and may constitute a serious problem, while in other cases, even of carcinoma, some period may elapse before evidences of a diminished economy are appreciated by the patient. Starvation is particularly frequent in cases attended with marked dysphagia, the patient avoiding food because of fear of pain. This occurrence is not unusual in neurotics. In marked obstruction of the esophagus, resulting from malignant disease, the inanition is often very extreme, there being two factors in its causation. In the later stages, however, decomposition of the cancerous masses occurs within the lumen of the esophagus, thus widening out the opening and permitting better passage of food into the stomach, the emaciation thus being lessened.

Cough and dyspnea sometimes are disturbing factors of the comfort of one affected with esophageal disease. The cough is generally caused by an extension of the inflammatory process or other pathological state of the esophagus to the trachea and larynx. The other symptom, dyspnea, may be caused by pressure upon the above organs in close proximity to the esophagus, or upon the two laryngeal nerves controlling them. A sudden attack of spasmodic coughing and extreme dyspnea during the partaking of a meal may mean a perforation of the diseased esophagus into the respiratory tract, trachea or bronchus.

Hematemesis from esophageal causes, while not very frequent, is not uncommon and must be differentiated from the more common hemorrhages of the stomach and lungs. The most frequent source of bleeding from the esophagus is its dilated veins in cases of obstruction of the portal circulation. The esophageal veins are in communication with the intercostals, the venæ azygos, diaphragmatic, superior gastric and others. These terminate into the venæ cavæ. Disturbance in the circulation of the latter (as in cirrhosis and thrombosis of the liver) occasions stasis of the esophageal veins, dilatations, varicosities, and possibly rupture. Blood may also be found tinging the vomitus, and may then be derived from ulcers, new growths, etc. of the esophagus. Sudden enormous hem-

orrhages may occur from rupture of neighboring organs (aneurysms aortæ) and perforation into the esophagus.

ESOPHAGEAL DISEASES.

While the above enumerated symptoms are encountered more or less in all pathological disturbances of the esophagus, differing merely in their intensity and qualifications, yet there are certain features which are rather characteristic of the individual diseases of the organ and which may be utilized to arrive at correct conclusions in their differential diagnosis. It seems, therefore, excusable to review briefly the most typical symptoms associated with the more common disturbances of the esophagus.

Foreign bodies, most commonly encountered in children and comprising numerous articles: pebbles, tacks, coins, jacks, beads, etc. In adults the swallowing of bones and false teeth is not infrequent. The accident may occur in a manner known to the patient, or he may be unconscious of it. The history usually determines the diagnosis, but not always, in cases of children. The sudden onset of the complaints, the acute dysphagia, the choking sensation in the throat, the inability to swallow solids, the sanguinous vomiting, the obstruction to the passage of an introduced bougie, are determining factors in the diagnosis of a foreign body in the esophagus, and will help to differentiate these from those of the larynx, trachea and bronchus. In addition, positive proof may be obtained by the Roentgen ray: Fluoroscopic or radiographing the esophagus with the patient in the correct position generally reveals the presence and place of foreign bodies within the organ.

The inflammations of the esophagus embrace all varieties encountered in the other hollow organs lined with a mucous membrane: catarrhal, phlegmonous, follicular, diphtheritic, etc. The diagnosis may oftentimes be correctly established by the subjective symptoms alone. The history may point to direct extensions of the inflammatory processes of the esophagus from the adjacent organs (pharynx, catarrhal inflammation, the larynx, diphtheritic, etc.) or it may lead to some other cause of the inflammation, such as swallowing of corrosive poisons, with or without suicidal intent. The pain in inflammatory conditions may be felt in the neck, if the pathological processes are located in the cervical portion of the organ, or it may be substernal, if below. It is generally continuous and severe. Deglutition is very difficult, painful and is proportioned to the extent of inflammation. Vomiting is common and is characterized by the admixture of considerable quantities of thick, tenacious, perhaps sanguineous or purulent mucus, containing mucous cells and fibres, numerous exfoliated epithelia, leucocytes, pus, blood corpuscles and other morphological elements. There is a choking sensation in the patient's throat, and often there is inability to

swallow even fluids. The roentgen examination is not of equal value in the purely inflammatory conditions of the esophagus as in its other pathological states. It does not reveal the lesion itself, but only its accompanying phenomena, such as spasm and abnormal peristalsis. Bougies and the esophagoscope, because of tenderness, pain and danger of perforation in severe corrosion, cannot always be utilized. The esophagoscope though, if employed, gives the most valuable information as to the real condition of the mucous membrane of the organ, and helps in the diagnosis of the variety, the extent, the severity, and the position of the inflammatory processes.

Ulcers.—Next to carcinoma, ulcers are perhaps the most frequent pathological lesion of the esophagus. Their location is more or less characteristic of the nature of the ulcer: decubitus—high up near the pharynx; peptic—near the cardia; inflammatory—at the normal constrictions and curvatures of the esophagus. Ulcers are the consequences of numerous affections. In the lower portion of the esophagus near its entrance into the stomach is the seat of the so-called *peptic ulcers*. These are probably caused in predisposed individuals by the regurgitated hyperacid stomach fluids in cases of hyperacidity and hypersecretion of that organ. The presence of peptic ulcers near the cardia is the underlying cause of cardiospasm, a condition formerly assumed to be a neurosis pure and simple. In the diagnosis of this variety of ulcers, the peptic, their characteristic position (in the lower third of the esophagus or in the so-called antrum ventriculi where in rare cases the organ is widened to form an antechamber), plays an important rôle; in addition, the constancy of pain and discomfort, the steadiness of their localization, the occurrence of the pain after meals, the hyperacidity of the stomach contents, the regurgitation and vomiting of food soon after meals, and the spasmodic hour-glass constrictions of the esophagus, as determined by fluoroscopy, are additional factors helping to establish the diagnosis of peptic ulcers of the esophagus.

Decubitus ulcers are frequently mistaken for those of a tubercular, cancerous, or gangrenous character. They occur in bedridden, emaciated and very debilitated individuals, and are merely manifestations of pressure necrosis, being caused by pressure of the cricoid cartilage of the larynx upon the organ intervening between it and the spinal column, the esophagus. This is the result of the relaxation of the supporting muscles of the larynx, thus permitting the latter to fall backwards upon the esophagus. The position of decubitus ulcers in the esophagus is therefore immediately behind that of the cricoid. They usually occur in pairs, are either oval or irregular in shape, and superficially situated. Their identification in tubercular individuals, in whom the difficulty in swallowing occasioned by the ulcers is wrongly ascribed to a tubercular nature, is of great importance, for the cases are thus not infre-

heart, prominence of the arcus aortæ, aneurysms, distended diverticular ulcers are very rare in the esophagus, much rarer there than in any other part of the gastro-intestinal tract. Syphilitic ulcers are even still rarer, their presence in the esophagus being an exception. Decubitus ulcers, being visible to the unaided eye, may be diagnosed by ordinary inspection. Their location, their invariable appearance in pairs, their superficiality, their occurrence in extremely debilitated individuals, constitute sufficient proof for their detection and identification. *Tubercular* and *syphilitic* ulcers, if typical of ulcers characteristic of the respective diseases, can be diagnosed by their appearances through the esophagoscope.

Ulcers resulting from the swallowing of injurious substances or scars following such ulcerations have no differentiating characteristics to distinguish them from ulcers of other origin; they may only be so classified if their etiology so indicates.

The diagnostic features of all ulcers of the esophagus, regardless of their origin, nature or situation, are about the same and differ only with the specific sensitiveness of the pathological lesion and of the organ involved. The characteristic symptomatology has been previously described under peptic ulcers, but the most definite information may be obtained by roentgen examination; a sharp circular spasm located at the position of the erosion, active peristalsis of the portion of the organ above the lesion, a widening of the same part of the tube, the appreciable detention of the bismuth bolus at the place of constriction, the persistence of the latter in spite of repeated attempts at swallowing—all these evidences indicate typical ulceration of the esophagus.

Constrictions of the Esophagus.—These abnormal conditions are of serious import to the patient as they interfere with the function of his alimentation. The constriction may be caused in three ways: (1) Obstruction of the lumen by substances within the organ; (2) encroachment upon it, originating from the walls of the esophagus; and (3) constrictions caused by abnormalities outside the tube. Stenoses of the first description, caused by foreign bodies, have been considered previously under the chapter so headed. This exception should, however, be noted: obstruction of the organ from within the lumen may also be caused by pendulous papillomata.

Encroachments upon the lumen of the esophagus from its wall may be caused by neoplasms, inflammatory swellings or cicatricial tissues resulting therefrom, congenital narrowings, spastic contractions, etc. The third form of stenoses may be the result of compression of the esophagus by enlarged glands (inflammatory, tubercular, Hodgkin's disease), struma (cervical or retrosternal), abscesses (retro-esophageal, spinal, pulmonary), tumors (lungs, mediastinum, spine), effusions (pericardium), enlargement of the

heart, prominence of the arcus aortæ, aneurysms, distended diverticulæ, etc.

To diagnose the stenoses is not very difficult. In the early stages the patient becomes aware of an unpleasantness upon swallowing somewhat larger bites; in the more advanced stage, this sensation may grow to a feeling of complete arrest of the food at some particular place in the gullet. Regurgitation occurs from a few minutes to a longer interval, according to the depth of the stenosis. Emaciation is generally very marked. The diagnosis is definitely established by the introduction of a sound. The presence of a constriction is qualitatively determined by a permanent obstruction to its passage; while the location of this constriction is observed from the length of the sound to the incisor teeth. Its opening is deduced from the size of the bougie, the length of the constriction obtained if a Schreiber is employed, its appearance by the help of an esophagoscope, and its origin or numerous other details—perhaps by fluoroscopic examination. The common positions of strictures are (1) at the junction of the esophagus and the pharynx, (2) at the place of bifurcation of the trachea, (3) at the position of the arch of the aorta, (4) at the foramen diaphragmatica.

Stenoses are usually single; only those following the imbibition of caustic fluids are multiple. Stenoses caused by distended sacculated diverticulæ are recognized by the symptoms of the latter in addition to those of the stenosis. Such complications may be assumed to exist if periods of stenosis are followed by periods of relaxation, especially when the latter are consequent to severe vomiting spells. Constrictions of the esophagus caused by aneurysms, mediastinal tumors, enlargement of glands, pericarditis and other conditions outside the esophagus can be diagnosed, in addition to the *x*-ray information, only by the physical signs and symptoms peculiar to the respective diseases. The deviation of a metal sound passed through the esophagus during the *x*-ray examination excludes internal constriction and substantiates the location of the obstruction external to the esophagus. The dysphagia under these conditions is often favorably influenced by certain positions the patient may take, facilitating swallowing. This symptom, if present, also points to the fact that the obstruction is caused by substances without the esophagus.

Neuroses, Spasms.—The neuroses include increased peristalsis, antiperistalsis, spasms; the last most commonly. All spasms were formerly classified as neuroses, but lately some of these have been related to definite pathological lesions. Still there are a number of esophageal spasms in which anatomically no demonstrable lesion can be located, and these are yet classed as neuroses. The spasms identified with this class have a sudden appearance, apparently without any evident reason for their onset; they are inconsistent

with the objective observations; they are intermittent and irregular as to duration, position and severity; they often permit the passage of solid food and not that of liquid. In addition, these ills are generally associated with such other symptoms, more or less common to neurótics and suggestive of hyperirritability of the nervous system, as highly responsive nerve reflexes, dermatography, erythema fugax, hyperhydrosis, mydriasis, ptyalism, etc. To differentiate functional from organic spasms, several swallowing acts in quick succession, causing a contraction of the longitudinal muscles and a relaxation of the circular, will usually relieve the functional, while having no effect upon the organic spasms. Eructations, if present, may be very loud and be accompanied by regurgitation of food. The latter occurrence is permitted by the patency of the cardia in these cases, allowing the food to be regurgitated from the stomach into the esophagus, not only during eructations, but also upon coughing, deep inspiration, retching, etc. Nervous spasms are common concomitants of hysteria, epilepsy, chorea, intoxications, neurasthenia and similar nervous diseases. Spasms secondary to organic disease of the esophagus are very common; they are more stable in their characteristics, more constant and less transient than neurotic spasms. The method for their identification has already been described in the previous chapters.

Dilatations, Diverticulæ.—Dilatations of the esophagus, either total or partial, are another common affection of the organism. This condition is frequently secondary to a weakness of the circular muscle fibres of the esophagus from overstrain caused by the additional efforts in the propulsion of the food past the obstruction which is usually the etiological factor of the dilatation. Dilatations are generally circular, involving the whole circumference of the tube, but in some cases an especially weakened part of the wall may exist and first give way to pressure, thus forming a depression at first and later a diverticulum. According to the extent of dilatation, the latter may be diffused, involving even the whole length of the esophagus; circumscribed—affecting only part of the circular wall of the organ and not the whole length; or diverticular—extending only over a portion of the wall and not including the whole circumference of the esophagus. The first variety, total dilatation, is sometimes congenital, but more frequently the result of protracted cardiospasm. In the latter cases the tube may become unusually widened, even as voluminous as the large intestines. The symptoms, under these circumstances, are very pronounced, and dysphagia is prominently so. Vomiting occurs late after meals, perhaps from a quarter of an hour to several hours after meals, and in such quantities that it may appear to arise from the stomach and may have to be differentiated from vomiting from the latter organ. Fullness in the epigastrium and pressure along the spine are inevitable accom-

paniments. The sound not only meets without obstruction, but, on the contrary, can be freely moved from side to side. This condition, as the others, can best be diagnosed roentgenographically.

Circumscribed dilatations, accompanying most cases of stenosis, both organic and functional, are unusually common and present themselves in various forms. *Diverticulæ* occur either primarily as congenital, or secondarily to disease, either from pressure within the esophagus or traction upon its walls from without. *Diverticulæ* also vary greatly in their dimensions and may reach the size of enormously dilated sacks. Their usual position is generally at the lower portion of the esophagus, behind the bifurcation of the trachea (tracheal diverticulæ) or still lower in or about the antrum cardiae. They may remain symptomless for a number of years even if of considerable size. The dilatations may be diagnosed fluoroscopically when the patient in the semi-recumbent position is administered bismuth water. In addition, the other methods of roentgen examination are, of course, to be utilized. Otherwise the cases are diagnosed by the complaints. There is considerable salivation and eructations, with partial expulsion of food after meals and accompanied oftentimes by severe coughing spells and terminating in relief from the various symptoms of stenosis. The amount of fluid vomited may be variable, from 50 c.cm. to one-half litre or more. It contains no hydrochloric acid, but is alkaline in reaction, and contains ingested food ingredients, sugar substances, and bacteria commonly associated with stasis of food, yeasts, fungi, sarcinæ, etc. Other symptoms, more or less frequently associated with diverticulæ, are pressure behind the sternum, a dragging sensation along the spine or behind the sternum, pain of a spasmodic character, and symptoms of intoxication in general. Introduction of a sound may, in the larger varieties of diverticulæ with broad openings, meet with resistance, as the sound may enter the pouch and be prevented from passing into the stomach by the bottom of the diverticulum. If so, this symptom is of great diagnostic value.

Carcinoma.—The most common disease of the esophagus and practically the sole affection in patients beyond three score years. It is the cause of nearly all organic pathological stenoses occurring at the age just mentioned. New growths of the esophagus are chiefly primary, but they also affect the organ secondarily and in addition to the neighboring organs: mediastinum, spine, lungs, glands, etc. The disease generally attacks aged people, but the young are not entirely free from its ravages, and stenosis carcinomatosa in the young is at times encountered. Only lately has the writer come across this condition in a man of thirty-four.

It would seem unnecessary to urge upon one the importance of the early diagnosis of cancer. An early diagnosis is very desirable

in every case of carcinoma, but it is particularly necessary in that of the esophagus. Willy-Meyer, who has done splendid operative work in thoracic surgery and upon the esophagus, requires diagnosis and operation of esophageal cancer during the first stage of the disease, *i. e.*, when the tumor is still limited in extent and the involvement superficial. During the second stage, after the tumor has already affected the entire thickness of the wall and caused stenosis of the esophagus, there is still occasional hope of relief for the unfortunate; perhaps even a permanent cure may be achieved through operative interference. But unfortunately even then the disease remains often unrecognized and is even permitted to enter the third stage until the tumor has spread beyond the esophageal walls and affected the neighboring organs. Then an operation not only is useless but prohibitory. The patient's lot is a sorry one. Therefore every complaint of elderly individuals bearing upon the esophagus should receive the most serious attention and never be taken lightly, as is often done in practice. We must be watchful, because, at the beginning particularly, esophageal tumors appear mild, the most malignant remaining localized and not involving additional organs until quite late in the history of the case. Esophageal tumors may be diagnosed by the following data. In the first place the age of the patient has to be taken into consideration (from forty to seventy years), then the gradual and incessant progress of every symptom, the constantly increasing annoyance occasioned by the dysphagia, the growing obstruction to the passage of food, the regurgitation and vomiting, the progressive cachexia, the absence of any other cause explaining the existence of the enumerated symptoms, etc.

The esophagoscope, if employed, reveals ulcerations of the mucosa or irregular projections of masses into the lumen of the organ. The radiosopic examination gives extremely valuable information in such cases; it shows the form, the extent, and outline of the obstruction, the deformity and deviations from normal of the shape of the lumen, the dilated part of the esophagus above the obstruction, the persistence of the stenosis in all positions, either erect or prone. The sound also helps to determine the position of the obstruction and its distance from the teeth. Upon the withdrawal of the sound, the latter may often carry in the depressions of the tube some of the fluid substance accumulated at the lesion and often containing cancerous particles, epithelia, blood, pus cells, food and other decomposed material. In those cases where the infiltration is still confined to the walls of the esophagus, thus causing no noticeable tumefaction of the esophageal wall, the sound may glide over the latter, meet with no appreciable obstruction, and thus hide the real condition of the organ. The other diagnostic features of esophageal cancer are those attending the accompanying hyper-

trophy and dilatation of the walls of the organ above the seat of the lesion, such as regurgitation, eructation, dysphagia. Additional information may also be garnered from an analysis of the gastric fluid. The stomach, if not involved, usually suffers when the esophagus is attacked with carcinoma, particularly if the latter is situated near it, at the cardia. A deficiency in the composition of the gastric juice may constitute yet another indicator in the direction of correct diagnosis of esophageal cancer.

The enlargement of the glands accessible to palpation occurs only in the later stages of the disease; hence the diagnosis should not be delayed until the appearance of enlarged glands or until the liver is enlarged by metastases. The glands first to be involved are those at the root of the lungs, hence those inaccessible to examination except perhaps by the *x*-rays; then, in order, are the cervical, clavicular, etc. However, as their affection is slow, they may thus tend to distract attention from the cancerous nature of the disease, as in a case Leube cites. In his case, despite the rapid growth of the esophageal cancer, the superficial glands did not only remain free from involvement, but the patient even continued to gain weight.

The variety of the cancer involving the esophagus is hard to establish unless particles of the new growth are obtained for microscopical examination. Polypi are usually situated in the uppermost portion of the esophagus near the pharynx, while the middle and lower portion of the organ are generally affected by epitheliomata. A sudden amelioration of symptoms of cancerous obstruction generally indicates a breaking down of the cancerous masses and widening of the lumen of the organ involved.

In conclusion it may be well to repeat that in the writer's opinion esophageal disease occurs a great deal more frequently than is usually assumed. Because of the numerous cases it has been his good fortune to encounter during the past several years in his work at the clinics abroad and in practice here, he has become thoroughly convinced as to the frequency of esophageal disease. He would therefore advise that (1) greater significance be attached and attention paid to the frequent complaints of dysphagia; (2) in individuals of fifty and over no ailment of the esophagus, even if nominal, should be disregarded until the most scrupulous examination is made and serious affections of the organ excluded; (3) the *x*-ray method of examination should be utilized in every case of questionable esophageal disturbances.

At the same time the writer wishes to utilize the opportunity to express his sincere appreciation and indebtedness to Dr. I. S. Hirsch, of the New York Post-Graduate School and Hospital, for the many privileges accorded him during the last two years for the study of esophageal and other diseases.

THE RELATION OF SYPHILIS TO GASTRO-ENTEROLOGICAL DISEASES.

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Syphilis as a factor in gastro-enterological diseases is given but little attention in English textbooks of medicine. Here and there in the literature are reported cases showing that syphilis in its late manifestations affects the digestive organs as well as other parts of the body. There is a wide difference of opinion as to the frequency of chronic digestive disturbances due to syphilis. Recent personal experience, however, in a number of cases unrelieved by medical or surgical measures, but entirely cured by antisyphilitic treatment following a positive Wassermann reaction, has led the writer to believe that syphilis is a more important factor in the causation of gastro-enterological diseases than has been formerly supposed.

Previous to 1903, the various stages and manifestations of the disease were well known as a result of the large amount of valuable material recorded by clinicians and pathologists. The obscure relationship existing between syphilis and certain diseases of the nervous system had been disclosed, but this material did not acquire its full value until Roux and Metchnikoff demonstrated that syphilis could be successfully transferred to the lower animals, thus making possible experimental study, and until Schaudinn in 1905 discovered the cause of the disease in the *spirochæta pallida*.

From a series of bacteriological observations, made in connection with the study of immunity, sprang that most valuable of diagnostic methods—the Wassermann reaction—the reliability of which now rests on a solid basis of experience. This reaction—a development by Wassermann of the Bordet-Gengou phenomenon—takes many an obscure symptom-complex out of the field of speculation and places it in the domain of fact. Since it has been proved, as a result of this discovery, that syphilis is the cause of many febrile conditions, affections of the central nervous system, tumors of bone and internal organs, and chronic skin diseases, ulcerative or otherwise, why should the alimentary tract be spared, when it offers such excellent soil for the development of syphilitic lesions?

Syphilitic disease of the liver is accepted as common. Ebstein¹ considers the possibility of syphilis in every case of chronic liver disease, especially when the diagnosis is at all obscure. Edwards²

calls attention to the closeness with which luetic disease of the liver simulates other affections. His conclusions, following the report of a case of "Syphilitic Febrile Pylephlebitis with Remarks on Syphilitic Fever and Aberrant Types of Hepatic Syphilis," are

1. What is seemingly a suppurative pylephlebitis, with intensely septicopyemic symptoms, may be a syphilitic pylephlebitis with spirochete sepsis.

2. There is always the possibility that various vague or obvious portal-vein, gall-bladder, and liver symptoms may be syphilitic—a possibility of vast therapeutic significance.

3. A diagnosis of syphilis made *ex juvantibus* may be open to criticism. While not of absolute certainty, such means of diagnosis of syphilis exceed the degree of probability.

4. Hepatic gummata may precisely simulate hepatic cancer, even to the extent of the characteristic cachexia, and perhaps, also, of the significant gastric findings.

5. Certain cases of seeming atrophic cirrhosis may respond to antiluetic remedies.

6. Cholelithiasis, cholecystitis, and hepatic abscess may be simulated by syphilis of the liver.

7. Tertiary invasion of the liver or portal-vein may run its course without localizing signs, and masquerade as typhoid fever, septicemia, tuberculosis, or malaria. When the Widal reaction, blood cultures, tuberculin test and examination for plasmodia are negative, it is not fantastic to suggest the employment of mercury and iodides.

Hirschberg and Raichline³ report the case of a young man who came under their care suffering from an attack of acute gastro-enteritis. He had continued fever and intermittent diarrhea. The liver and spleen were enlarged. Diagnoses, first of typhoid, then of malaria, were made, and treatment rendered accordingly with no result. In view of a history of chancre, eight years previous, the mixed treatment for syphilis was begun. Within a very few days the fever began to subside, the enlargement of liver and spleen began to diminish, and at the end of twenty days the patient was considered cured. Riley⁴ reports a case of irregular fever, with negative physical examination, and negative tests for typhoid and tuberculosis. At no time were there any symptoms referable to the liver. Autopsy showed multiple gummata about the portal-vein in the liver; gummata of the spleen and kidneys; syphilitic hyperplasia of the spleen and lymph-glands. The cause of the fever and indefinite clinical picture in this class of cases is thought by Klemperer⁵ to be due either to the absorption of toxins from gummata or ulcerations therein.

Billings⁶ reports a case diagnosed as calculous cholecystitis, which was shown at operation to be multiple gummata of the liver, the

largest one situated just behind the gall-bladder, which was infected by the gumma. No gall-stones were present. The patient rapidly recovered from the operation, and prompt improvement followed antisymphilitic treatment. He says: "The absence of syphilitic lesions of the superficial glands, skin, etc., and the typical symptoms of gall-stones due to the infection of the gall-bladder from a gumma, led to a wrong diagnosis." It has also been pointed out by Graham⁷ that syphilis, when it attacks the stomach or liver, may clearly simulate ulcer of the stomach or gall-stones, and when quite advanced, the pain, cachexia, and vomiting may lead to a strong suspicion of cancer of the stomach.

It is, however, on syphilis of the stomach that too little emphasis has been laid. Our first knowledge of stomach syphilis dates back to 1839 when Andral⁸ reported 2 cases of chronic gastritis cured by mercury. In 1865 Topinard⁹ published a case of incessant vomiting cured by iodide of potash, and in 1866 Dujardin-Beaumetz⁹ published 2 cases of hematemesis cured by the same means. In 1869 stomach syphilis was definitely established pathologically by Klebs,⁹ who reported a case in which he found at autopsy an ulcer due to the breaking down of a gummatous infiltration of the stomach wall. A paper by Gaillard,¹⁰ in 1886, lays stress on the importance of syphilitic lesions of the stomach. He reports in detail 16 cases, previously reported by other observers, in which simple ulcers, gummata and cicatrices of the stomach were found and considered to be of syphilitic origin. He includes one case of ulcer of the duodenum with scar formation. Cornil¹¹ reports a case of gummata of the stomach found at autopsy. In this case the gastric mucous membrane showed along the lesser curvature, and in the vicinity of the pylorus raised groups of flattened tumors having diameters of 2, 3 and 5 cm. The mucous membrane covering these was intact but thin and adherent.

Mracek¹² states that syphilitic ulcers originating from gummatous infiltrations of the submucosa occur in the stomach. These have been many times demonstrated by autopsies. They usually appear in the region of the pylorus and of the lesser curvature, and also at the cardia. Infiltrations develop in the submucosa and extend both in the direction of the mucosa as well as in the direction of the peritoneum. Besides these ulcerations, gummatous infiltrations and cicatricial formations were found, so that the possibility of cicatrization of gummatous ulcers in the stomach cannot be excluded. Furthermore, ulcers due to a syphilitic endarteritis of the vessels of the stomach are met with. These have the characteristics of round gastric ulcers, both in a clinical and anatomical sense.

Birch-Hirschfeld¹³ reports the following cases:—

(1) Woman, aged forty-five years. Primary infection six years

before death; for four years she had suffered from gastric symptoms. Autopsy showed (1) a gumma of the liver the size of a fist, and (2) in the anterior wall of the stomach, near the pylorus, an oval, yellow, firm plaque, 8 in. long, showing slight ulceration. The base and edges consisted of firm cicatricial tissue, and the infiltration occupied mucosa and submucosa. The blood-vessels were obliterated.

(2) Man who exhibited gummata of the lymph-glands, jejunum and stomach. The last was of the nature of an ulcer, situated at the cardia, the edges of which were dense and gummatous, the base clean.

(3) Man, aged thirty-five years, infected four years previously, in whom were found gummata in the bronchial and mediastinal glands and small intestine, cicatrices in the liver, and an ulcer showing gummatous edges, affecting the lower end of the esophagus and extending into the stomach.

Einhorn¹⁴ reports 6 cases of gastric syphilis, illustrative of three distinct types of lesions—namely, (1) gastric ulcer of syphilitic origin; (2) syphilitic tumor of the stomach; (3) syphilitic stenosis of the pylorus. He says: "My own humble opinion is that syphilis of the stomach is by no means of rare occurrence."

Neumann¹⁵ claims that wellnigh 20 per cent. of the cases of round ulcer of the stomach occur in syphilitic individuals and should not be considered as a mere coincidence in lues.

Fournier¹⁶ relates at length the history of a case that is interesting for the reason that it would undoubtedly have been fatal had not the patient as a last resort sent for him. She was a singer whom he had treated in 1860 for a syphilitic lesion of the back. On the present occasion, seven years later, Fournier found her in a dying condition with a basin full of bright red blood near the bedside. She told him that for the last three or four months she had suffered with hematemesis and vomiting in spite of all treatment. Completely exsanguinated and greatly prostrated, she presented a pitiful appearance. With the old lesion of seven years before in mind, the inspiration came to Fournier to administer iodide of potash. The result was a miraculous and rapid recovery. Six years later, she dragged herself rather than walked into Fournier's consulting room, looking a veritable ghost. In answer to his inquiry as to why she had not used iodide of potash she replied that the physicians in Italy, where she had been staying, had refused to give it to her claiming it would cause her death. Fournier again prescribed it with the same brilliant result. In the same article he reports a case of Dieulafoy's. A man had suffered for eighteen months from severe epigastric pain and frequent attacks of vomiting and hematemesis. During this time the patient had had the best medical treatment for ulcer of the stomach, without avail. On admission to the hospital, the man was extremely emaci-

ated and exsanguinated. Vomiting was incessant, and the blood clots were so large that the patient had to remove them from his mouth with his fingers. Antisyphilitic treatment again achieved a wonderful result.

Hayem and Lion,⁹ in their book on "*Maladies de l'Estomac*," tell us that the existence of perforating syphilitic ulcer of the stomach is established by 4 cases, demonstrated by histological examination, and reported by Flexner, Schreib, Fränkel and Cesaris-Demel, in the latter of which there was not a perforation, strictly speaking, but a hemorrhagic inundation of the peritoneum. Hayem himself reports a case of a man of sixty years who showed all the signs of an almost complete pyloric stenosis. He vomited everything and was very much emaciated. Physical examination showed no tumor, but the chemical analysis of the gastric contents was not inconsistent with cancer. The diagnosis of cancer of the pylorus was made and a gastrectomy was done. Examination of the specimen removed showed that the growth was syphilitic. Fortunately, specific treatment begun after the operation proved efficacious.

Hemmeter and Stokes⁹ report a case in which they made a clinical diagnosis of pyloric stenosis. The trouble extended over a period of two years, but there was no cachexia and no tumor felt. For this reason new growth was not suspected. At operation there was found, on the greater curvature in the region of the pylorus, an indurated mass which was taken for carcinoma. Histological examination showed it to be specific.

There is a case reported by Frerichs⁹ in which a cicatrix, following a saddle-back ulcer on the lesser curvature, had produced an hour-glass stomach. Rudnew⁹ has found, in autopsies on syphilitic subjects, circular scar formations dividing the stomach into two or more pockets.

Beclere and Bensaude¹⁷ have reported in detail a case of bilocular stomach diagnosed by *x-ray* in which they have been able to follow, according as the patient recovered under specific treatment, the progressive disappearance of the bilocular aspect of the organ.

Leven and Regnard¹⁷ report the case of a man who for three years had suffered from severe attacks of what was supposed to be biliary colic. Surgical measures had been recommended. X-ray examinations showed pyloric stenosis. On account of the history of syphilitic infection twenty-two years previous, they decided, on the strength of the positive Wassermann reaction, to try antisyphilitic treatment. Immediate relief followed. Seven months later, *x-ray* examination showed that the stomach had returned to normal size, and that the obstruction about the pylorus had disappeared. This was not a true pyloric stenosis due to a cicatrix, but probably an

obstruction due to a syphilitic infiltration near the outlet of the stomach.

Faroy¹⁸ reports what he considers to be the first case of tertiary syphilis of the kidney with amyloid degeneration accompanied by a large gumma of the stomach. The patient was a woman thirty-four years of age, feeble and emaciated. She had edema of the extremities, ascites, and a hemorrhagic effusion in left pleural cavity. The liver and spleen were both enlarged and palpable. There was profuse diarrhea, and urine contained albumin, 30 grm. to the litre. The diagnosis was amyloid disease of kidney and intestines due to probable tuberculous infection of pleura and peritoneum. Autopsy revealed tertiary visceral syphilis with amyloid degeneration of the kidney. The stomach mucosa was normal in appearance, but there was found on the greater curvature a large fluctuating tumor, regularly rounded, containing a yellowish white, gummatous substance, localized clearly in the submucosa. The intestines were much congested throughout their whole length and near the ileocecal region presented a granular appearance, probably amyloid degeneration.

Acquired syphilis occurs in the intestine as an accompaniment of syphilitic lesions in the other abdominal viscera. The pathological conditions described are gummata, gummatous ulcerations, endarteritis, endophlebitis, and endothelial cell-proliferation. They occur most frequently in the rectum, and to a lesser extent in the jejunum. Arkin¹⁹ reports a case of syphilitic ulcer of the intestine in which he demonstrated the spirochetes.

Syphilitic disease of the pancreas is of some interest in this connection. It has been shown that fibrous degeneration of the pancreas occurs simultaneously with the more frequent syphilitic lesions of the liver, with or without gummata.

Gastric crises due to syphilis of the central nervous system often-times bring on a chain of symptoms so severe that surgical measures are deemed necessary. In many of these cases the spinal fluid only will show positive evidences of syphilitic infection. It is probable that many of the cases of gastric disturbance with or without hematemesis which exhibit negative findings at operation might show a positive Wassermann reaction with blood or spinal fluid. Slight differences in size of pupils or slight departure from normal in pupillary reflexes, a lively, tardy or absent knee-jerk always justify a Wassermann test. In fact, syphilis of the central nervous system should always be kept in mind in every chronic digestive disturbance and absolutely ruled out by careful physical examination and serological tests.

There exists a close anatomical and physiological relationship affecting all the organs concerned in digestion. This is explained by the embryological facts—namely, the stomach, first half of the

duodenum, liver, and pancreas are derived from the foregut. The intestine from the middle of the duodenum to the splenic flexure of the colon is derived from the midgut. Physiological researches show that the pyloric sphincter is controlled by the duodenum, and is influenced by pathological conditions throughout the entire alimentary tract. The explanation of the gastric symptoms which occur in diseases of the liver and gall-bladder, in appendicitis, acute and chronic, and other diseases of the intestinal tract lies in the fact that disturbances in these organs bring about a spasmodic closure of the pylorus, which prevents the onward passage of stomach contents, and, as a result, we have indigestion and gastric distress.

Outside the presence of localized tumor, enlargement of the liver or gall-bladder or muscular spasm, physical examination of the abdomen is negative in many gastro-enterological diseases. The location of tender points is not absolutely indicative of any particular condition. For diagnosis, the decision rests largely upon the history, analysis of stomach contents, to which less attention is paid now than formerly, and *x*-ray examinations. There are no special symptoms characteristic of syphilis of the abdominal viscera. The evidence produced, however, shows that visceral syphilis can give rise to febrile conditions simulating typhoid, malaria and tuberculosis, and that it produces lesions which cause a chain of symptoms analogous to those of other diseases of the gastro-enteric tract.

Baetzner,²⁰ in Bier's clinic in Berlin, performed the Wassermann tests in 120 cases, and reported 25 positive findings in cases in which there was no history of syphilis, and furthermore nothing in the physical examination to suggest it. As a result of antisymphilitic treatment, conditions thought to be cancer, sarcoma, tuberculosis, lupus, and other affections of similar serious nature were entirely cured.

Syphilis is of vital importance to internists and surgeons who are called upon to deal with a great variety of affections in many of which it may be the fundamental cause. To-day this disease is a problem of general medicine. While its manifestations ramify into all the special fields of medical practice, its diagnosis and treatment do not belong to any one particular branch. The day is at hand when our Boards of Health, if they wish to be progressive, must make the means of serum diagnosis as readily available to all practitioners of medicine and surgery as is to-day the bacteriological diagnosis of diphtheria and the Widal reaction for typhoid. Sufficient evidence has been presented here to show that syphilis plays a very important part in producing symptoms referable to the abdominal viscera. Therefore, it behooves all concerned in the treat-

ment of these conditions to exclude its possibility before submitting patients to surgical measures.

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MEDICAL TREATMENT OF BENIGN STENOSIS OF STOMACH, PYLORUS AND DUODENUM.

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In recent years it has almost become an axiom that obstructions in pylorus and duodenum have to come under the surgical knife, and that medical treatment has become useless in cases of this kind. Of course, there are many physicians who do not share this opinion and still believe that under correct diagnosis, and corresponding correct treatment, many cases of dilatation of the stomach, caused by stenosis of pylorus or duodenum resulting from scars of gastric or duodenal ulcers, cannot only be cured but also remain cured. Various methods of treatment have been recommended as successful in the primary treatment of ulcers without the aid of the surgeon's knife.

In this short treatise the writer will leave out entirely the treatment of malignant tumors, and will only speak of the benign obstructions, which, according to the history of the cases, must have had their origin in a previous ulceration or inflammatory condition of the pylorus or duodenum or of the stomach itself.

First of all, it is necessary that the correct diagnosis has been made.

We, of course, will not forego the usual treatment by mechanic, dietetic and hygienic measures.

The treatment which has given particularly good results in a number of cases under the writer's observation is the use of thiosinamine (allyl sulphocarbamide), which he usually administers subcutaneously at any part of the body most convenient. The treatment can be administered ambulant, and the patient need not be in bed or need not give up his or her occupation.

The first article on the use of thiosinamine in stenosis of the pylorus was written by Hartz in the *Deutsche medizinische Wochenschrift*, February, 1904.

Since that time the writer has used the hypodermic administration of thiosinamine in a number of cases upon various indications, such as deep scars resulting from suppurative glands, scars remaining from smallpox, from burns, cuts, and the removal of warts, and also in cirrhosis of the liver.

Thiosinamine or rhodalline is chemically allyl sulphocarbamide

or allyl sulphourea and its chemical formula is $\text{CS.NH}_2.\text{NHC}_3\text{H}_5$. It is a modification of urea, the formula of which is CONH_2NH_2 , whereby the O in the carboxyl is replaced by S, while one H of the amine group is replaced by the radical of the allyl series C_3H_5 . It occurs in the form of colorless crystals with an acrid taste, near the taste of mustard from which it is prepared. Thiosinamine is obtained by the action of absolute alcohol and ammonia on ethereal oil of mustard.

Thiosinamine can be administered internally, locally and subcutaneously. It is soluble slightly in water, better in water and glycerine, but best in alcohol or alcohol-water, and in collodium. Fibrolysin is a solution of thiosinamine and salicylic acid.

First the writer used the solution with a mixture of water and glycerine, but he found the solution inconvenient on account of the necessity of warming it at each administration, as otherwise the crystals were not entirely dissolved. The best results were observed when administered hypodermically, and it may be said here, the injection can be given at any part of the body most convenient.

For the purpose of this article the writer will give the short histories of 4 cases of benign pyloric or duodenal obstruction.

CASE I.—D. A., single, *æt.* thirty-two, dressmaker. Weight in 1899 was 135 lb.; health good. In the spring of 1900, went to the clinic for diseases of stomach and intestines (Polyclinic Hospital, then under the late Dr. D. D. Stewart). At that time the diagnosis of gastric ulcer was made. After a few visits, patient felt somewhat improved and did not return until a year later, complaining of similar symptoms. As the ambulant treatment did not appear to have much effect, patient was advised to enter a hospital. She went there with directions given by the writer, which, however, were not carried out. She remained in the hospital for two weeks; no improvement, and she returned to the Polyclinic Dispensary. In January, 1902, she came to the writer's office still complaining of symptoms of pain after eating, so that she hardly ate anything at all. Her weight had come down to 100 lb.

Physical Examination.—Tall woman, emaciated, pale, muscles flabby, marked tenderness on pressure in the pyloric region and severe pain about one hour after meals. Patient does not vomit, but induces vomiting to relieve the pain. Vomitus does not show blood, but the stool, which was constipated, was often dark brown and even blackish; has weak and fainting spells and has to stay in bed occasionally for a few days. It is worth while to remark that the shape of her body showed a very decided inclination on the part of the woman to former tight lacing, the shape was almost that of two triangles, the apices forming the waist line; heart and lungs normal as to sounds, apex beat a little to the right of the mamillary line.

Abdomen.—No adipose tissue; gastroptosis; stomach dilated; all viscera more or less displaced; tenderness in the epigastric and dorsal region; pain more in the region left to the pylorus. In the same neighborhood there is a resistance in the shape of an elongated swelling about 2 in. long and about 1 in. wide.

Examination of the stomach-contents showed delayed peristalsis and hyperchlorhydria. After excluding a malignant process, and after painstaking examination in all respects, the writer made a diagnosis of stenosis of the duodenum following the cicatrization of a chronic ulcer which perhaps even

had perforated with following perigastric or periduodenal adhesions. This diagnosis was agreed in by Dr. Stewart. After having advised operation, which was refused, the writer tried the usual treatment for gastric ulcer—namely, the regular ulcer cure, the use of nitrate of silver and beta-naphthol-disulphate of aluminum, bismuth nitrate, olive oil and absolute rest. Cure with exclusion of mouth-feeding and application of rectal feeding. All these measures had a beneficial effect which, however, was but temporary. As the patient was very averse to an operation, the writer put before her the ultimatum that he would try some other treatment, with the proviso, however, that if she were not benefited, she would then undergo an operation. As her pain was insufferable at times, she agreed.

On March 29th, 1904, the writer gave the first injection of $\frac{1}{2}$ gr. thiosinamine in hydro-alcoholic solution. First he gave the injection every third day, then every second day, and as he found that the patient bore the injections well, every day. The improvement was rapid, and the last injection was given on April 29th. Patient could eat, without pain or distress, any kind of food, and gained 17 lb. in two months. The good result has now lasted for over ten years. Patient weighs 127 lb., has no feeling of cramps or colicky pain; the above-mentioned elongated, flat swelling cannot be palpated.

CASE II.—F. D. U., *æt.* forty-eight, single, saleswoman in department store; tall, of slight built, came under the writer's observation September, 1905. Had been suffering with indigestion and general gastric disorder for eight years. The constant standing in the store has contributed to the distress. Patient feels very weak on account of the possibility of ingesting only very little food.

Patient shows great will power, but has lately become very nervous and irritable on account of frequent severe cramps in the gastric region and vomiting, coming on several hours after meals. Meals are taken in fear of renewed attacks; the loss of food helps to invite nervous irritation; sleep restless.

Physical examination showed heart and lungs normal, but general ptosis of the viscera of the abdomen. Percussion and auscultation showed enlarged stomach. Bowels constipated; urine scanty, but no albumin, sugar or bile.

Repeated examinations of stomach-contents, particularly of vomitus showed hyperchlorhydria, fermentation (total acidity up to 80 and 90), motor insufficiency of the stomach, enlargement of the pyloric region. This case had been treated for eight years as nervous dyspepsia.*

First the writer treated this patient by lavage of the stomach, dietetic and hygienic measures. While the treatment brought some relief, the same never lasted more than two or three days, when the old attacks of pain, cramps and vomiting returned. On October 14th, he injected the first dose of thiosinamine. The injection always caused some pain, sometimes of two or three hours' duration. The injections could be given only at intervals of two, three or even five days. Seventeen injections were given, the last one December 4th. The improvement was slower than in the previous case, but the cure has now lasted for over eight years.

CASE III.—M. G., *æt.* thirty, married, one child. History shows that at the age of eighteen she had been suffering from pain in the epigastric region, 'rheumatic' pain in the back, occasional vomiting; has never felt quite well since, and was always afraid to eat, as food did not agree with her. She married at the age of twenty-four years, felt pretty well during pregnancy, nursed the baby, but in the last three years has had frequent attacks of cramps about one or two hours after meals, lasting for several hours. Appetite is

**Pennsylvania Med. Journ.*, February, 1906.

Boas-Bernheim: Diseases of the Stomach, p. 515. Philadelphia. 1907.

good, has desire to eat, but is rather afraid of eating as it gives her 'indigestion.' At times she becomes very hungry so that she must eat, only to be troubled again in a few hours. Is very nervous and excited. Sleep interrupted. Has been under medical treatment for a long time; particularly treated for gall-bladder disorders, and was advised operation. Weight is 92 lb., has lost much flesh. Well-proportioned woman, with little adipose tissue.

Physical examination shows heart and lungs normal. Abdomen flat; liver not enlarged; slight ptosis of the stomach; kidneys not palpable. Epigastric region not particularly tender on pressure, with exception of the gall-bladder-pylorus-duodenum.* Palpation of that area yields some resistance, the feeling of a soft rubber ball.

Examination of gastric contents shows delayed motility and slight degree of hyperchlorhydria. Urine normal, no bile or bile pigments. Bowels are constipated; small hemorrhoids.

Diagnosis.—Cicatricial, obstructing tissue either in pylorus or duodenum.

After the usual dietetic treatment and general hygienic, mechanotherapeutic measures, without much benefit, the writer started the injection of thiosinamine. A few hours after injection he was called to see the patient who was severely suffering from general malaise, headache, fever of 103° F., severe pain in the limbs and joints, and sore throat. This whole attack looked like a beginning of severe acute articular rheumatism. In less than twenty-four hours all the symptoms had disappeared. Four days later, the second dose of thiosinamine (gr. $\frac{1}{2}$) was injected, and this injection was again followed by the same symptoms of severe acute febrile character as the first injection. This time the writer recognized these symptoms as of an anaphylactic kind—here was a patient with a particular idiosyncrasy to the thiosinamine.** He waited then for two weeks before injecting the third dose of thiosinamine ($\frac{1}{4}$ gr.), and again the same acute febrile attack followed.

The gastric symptoms themselves were certainly not aggravated, but rather improved. Patient could eat more food, with less gastric disorders.

The writer gave up the hypodermic injection of thiosinamine, but gave thiosinamine in doses of 1 or 2 gr. in capsules, and locally over the epigastric area in question. He constantly applied thiosinamine dissolved in collodium. The internal and local administration of thiosinamine did not bring about the anaphylactic reaction, but as to the result of the stenotic condition it took six months to secure the result which hypodermic injections might have done in a month.

The gastric symptoms disappeared entirely. Patient eats any kind of food without dyspeptic symptoms, and on July 15th, 1904, three years after the beginning of the treatment, weighs 124½ lb.

CASE IV.—L. B., *æt.* fifty-four, female, single, dressmaker. The writer was called in consultation by Dr. B. Singer, the first time in 1907. Patient complained of pain in the stomach, and of vomiting. As patient had been assiduously attending to her occupation, the writer advised rest for a few weeks with accompanying dietetic and physical measures. Patient improved, and the writer was called again on February 14th, 1911. For the last three weeks, no appetite; rather hungry; feels weak, no vomiting, drowsy; distension of stomach after meals; she thinks she lost weight, which at present is 103 lb.

Pain on pressure in left epigastrium and left dorsal side, and also appendix region.

*Deaver during his operation usually refers to a spot—the size can be covered by a dollar—where you can find affections of either pylorus, duodenum, gall-bladder or pancreas.

**Similar case has been reported.

Test-meal (Boas-Ewald) shows absence of free hydrochloric acid; small total acidity; no lactic acid. Weight 102½ lb.

One week later, oatmeal test showed free HCl present; no lactic acid; starch digestion fair. Weight 104½ lb.

March 4th, Ewald test-meal showed free HCl present. Pain on pressure. Weight 103½ lb. March 28th, weight 102½ lb. The writer did not see patient again until May 20th. Similar symptoms. A soft, small tumor palpable in pyloric region. Weight 96½ lb.

May 26th. Same symptoms. Weight 97½ lb. Prognosis given at that time to Dr. Singer (who is a relative to the patient) as doubtful.

Patient got along with various changes in her state of health, working at her occupation. In October, 1913, the writer was called again. Pain, cramps in the stomach region. Frequent vomiting, fair appetite, but does not eat much. Stomach-content-examination showed free HCl; marked delayed motility.

On December 10th, 1913, Dr. George E. Pfahler took a number of plates between the forenoon and evening.

On December 13th, Dr. Pfahler sent the writer the plates and a letter, in which he says that there is an obstruction of the pylorus (not malignant), and dilatation of the stomach, and recommends an operation. After consultation with Dr. Pfahler, particularly as he excluded malignancy, the writer suggested the use of thiosinamine. Between December 16th, 1913, and January 20th, 1914, the writer gave 17 injections of thiosinamine. Result very good. Only a few days ago (August 11th) patient writes from the seashore, of her 'fine' health. The writer has not yet been able to get a second examination by x-rays, in order to make a comparison between the first and second examination.

The action of thiosinamine is without doubt a constitutional one, whereby we can exclude a local effect. Thiosinamine is not a new drug, but has been used in various affections for more than twenty years. It has often been compared to the action of tuberculin in regard to its constitutional reaction. The fibrous or scarry tissue, for which thiosinamine has a special predilection, is usually but poorly nourished on account of its poor vascularization; the action of thiosinamine shows itself in producing a hyperleucocytosis, which is followed a few hours later by a marked hypoleucocytosis. This decrease of leucocytosis is, however, very soon followed by a new hyperleucocytosis, continuing throughout the period of administration of thiosinamine, though not to such an extent as in the beginning of the treatment.

Various writers, who have reported cases of administration of thiosinamine, have not had the same successful results—the reason for which the writer is not able to say, unless the cases were not the appropriate ones. From his experience the writer would consider accompanying adhesions in cases of cirrhosis of the liver as a strict contraindication to the administration of thiosinamine.

All cases in which abdominal operations have been made, are contraindications, likewise cases of patients with either active or latent foci of tuberculosis.

Surgeons have told the writer that in the end these stenotic conditions will come to them. We could safely disagree. On the other hand, many cases operated for gastro-enterostomy or pyloric operations have returned from the surgeon to the physician.

In cases, correctly diagnosed, whereby malignancy must be excluded, the administration of thiosinamine in the treatment of pyloric or duodenal (also in hour-glass stomach) obstruction may be recommended.

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GASTRO-INTESTINAL DISTURBANCE DUE TO NITROGEN RETENTION.

By MALCOLM SEYMOUR, M. D., of Boston.

(From the Department of Theory and Practice, Harvard Medical School.)

The first indication of serious trouble of the kidneys may be a gastro-intestinal crisis. A person in previous good health may have a sudden attack of acute indigestion, or the onset may be more gradual. A damaged kidney may be able to eliminate a moderate amount of nitrogen, but if this be increased slightly, symptoms of mild nitrogen poisoning may appear, such as slight nausea, distaste for food, especially of meat, fish or eggs, almost total loss of appetite, a feeling of lassitude, or a condition of mental sluggishness.

That this is due to nitrogen retention, and that all these symptoms may be produced by increasing the nitrogenous intake in those with inefficient kidneys, seems to have been proved by our work in nephritis during the past year.

In our study of chronic interstitial nephritis, with hypertension, 15 cases were selected with varying degree of kidney involvement, but all with high blood-pressure.* The work was divided into three periods of five days each. During the first period, the patients were given the regular hospital diet. Then followed a high and a low proteid intake period. At the beginning, during, and after these periods, blood-nitrogen determinations were made.

At the start, most of the cases showed a higher than normal amount of blood-nitrogen. At the end of the high proteid period, most of the cases showed an increase of the blood-nitrogen, and at the conclusion, the nitrogen content markedly decreased.

Coincident with the increased proteid intake, gastro-intestinal symptoms appeared: nausea, vomiting, diarrhea, gastric pain, and entire loss of appetite; while as the proteid intake was lessened, the symptoms entirely disappeared.

Recently this work was repeated with 5 similar cases, and although no nitrogen determinations were made, the gastro-intestinal symptoms appeared as before. In this last series, the kidney involvement was not as advanced as in the first, and the gastric

*Folin, Denis and Seymour: The Non-Protein Nitrogenous Constituents of the Blood in Chronic Vascular Nephritis (Arteriosclerosis) as Influenced by the Level of Protein Metabolism. (*Arch. Int. Med.*, Vol. XIII, pp. 224-234, February, 1914.)

disturbance did not appear as early; but as the proteid intake was increased, the same symptoms appeared, and were quite as severe.

In addition to the gastro-intestinal disturbance already mentioned, puffiness of the eyelids and face, cyanosis of the extremities, and mental sluggishness were noted, and the patients complained of headache, backache, and pains in the joints and bones.

In this last series of cases, although the low proteid diet was continued for twenty-one days, there was no effect noted on the blood-pressure (see Charts).

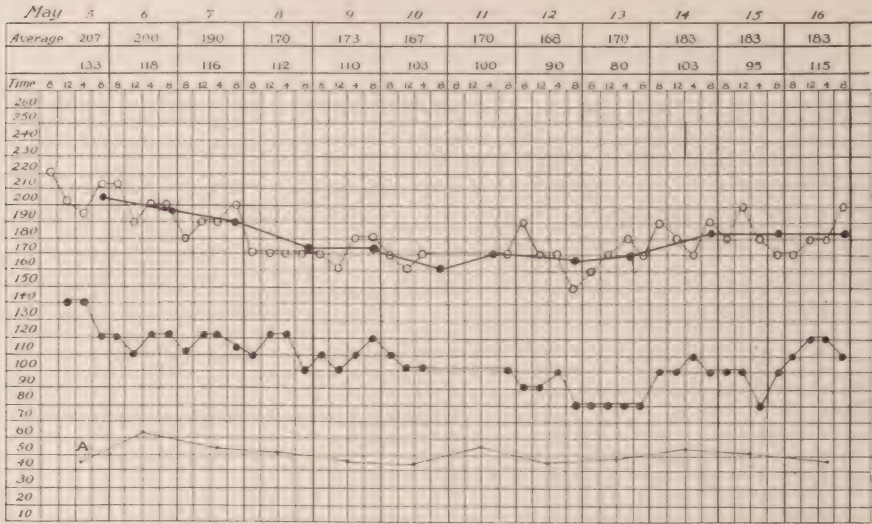


Fig. 1.—Chart showing diastolic and systolic blood-pressures. Proteid intake in line A.

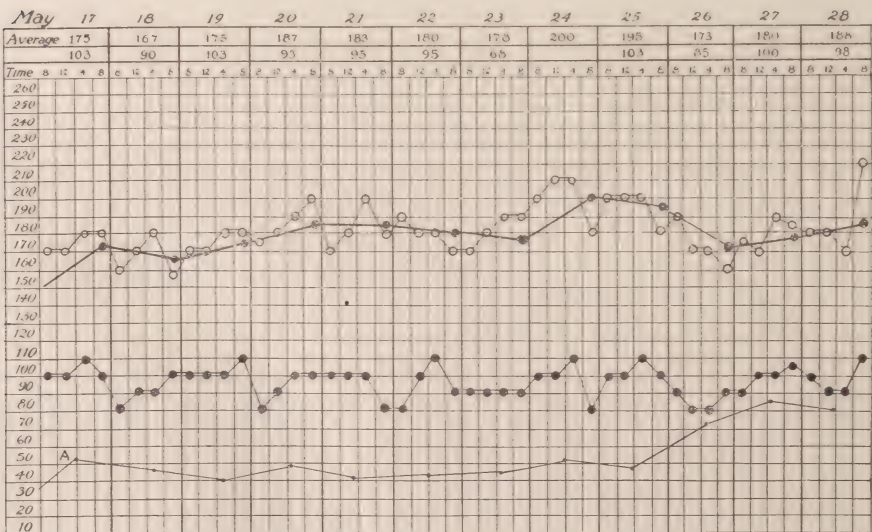


Fig. 2.—Chart showing diastolic and systolic blood-pressures. Proteid intake in line A.

After the second week of low proteid intake, the nocturia which had been marked in each case, practically disappeared, the number of night urinations being reduced from six, eight or ten, to one or two, and in one case the nocturia ceased. The fluid intake was not changed during the test, nor was the fluid output influenced, so

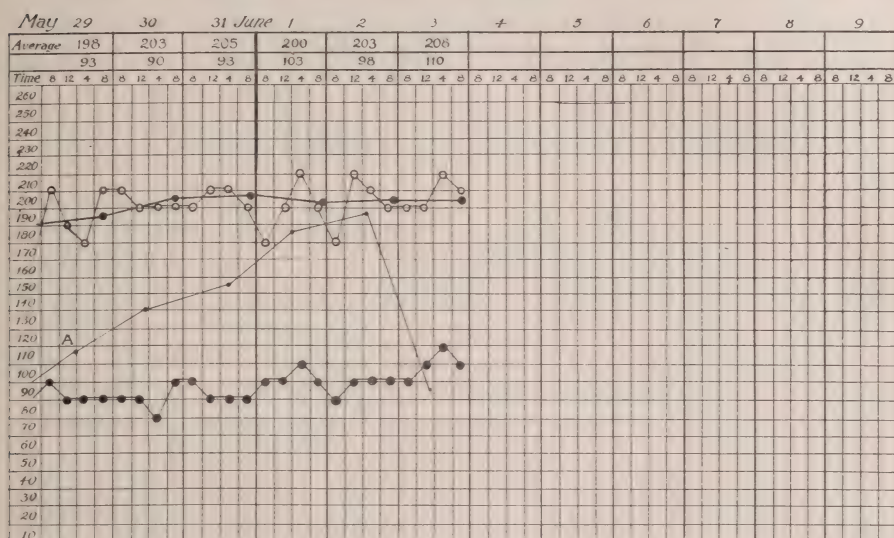


Fig. 3.—Chart showing diastolic and systolic blood-pressures. Proteid intake in line A.

that the beneficial effect was dependent entirely upon the low proteid intake.

At the conclusion of the low proteid period, the nitrogen intake was increased, and on the fourth day each case showed signs of proteid poisoning. The nocturia also returned.

LUETIC CONTRACTURES OF THE STOMACH. A REPORT
OF TWO CASES OF HOUR-GLASS STOMACH, WITH
POSITIVE WASSERMANN REACTIONS
AND IMPROVEMENT UNDER ANTI-
SPECIFIC TREATMENT.

By E. L. TUOHY, B. A., M. D., of Duluth, Minn.

It is not strange that a disease so protein as syphilis should also affect the stomach. The earlier treatises on the subject were accustomed to mention that the proximal and distal ends of the intestinal tract were prone to show syphilitic lesions, but not the intermediate. This false conception was naturally due to lack of observation. The literature on the subject of luetic stomach disease is as indefinite as it is voluminous. It would have to be classified, both according to the period and the instruments at hand with which the observer made the diagnosis. We may divide the literature into three periods. The first deals largely with post-mortem material, and covers a period from the classical report of Chiari,¹ 1891 up to 1905. All succeeding writers have quoted Chiari, as also Fenwick,² 1901.

Chiari, from a rich post-mortem material, reported that from a total of 243 syphilitic cases, 3 that he could definitely state had stomach lesions. In one of these, the evidence was only microscopical. Thus it is seen that he had a rather limited ground upon which to make his deductions. He stated that a summary of the literature up to that time showed only 18 cases having syphilitic stomach lesions, and 11 of these were acquired and 8 hereditary.

Flexner,³ in 1898, reported an autopsy upon a case of perforating ulceration of the stomach, with a gumma of the liver, and he concluded that the ulceration had been syphilitic. These 2, with Fenwick's lecture, comprised the bulk of the literature up to 1905. Moren,⁴ in 1911, quoted Fenwick as having reported a syphilitic history in 10 per cent of 308 gastric ulcers; and he also quoted Howard,⁵ in 1904, as showing that out of 82 cases of ulcer, 15 gave a syphilitic history. It must be definitely stated that in this period none of the modern methods were at hand to certify or establish the diagnosis, but the post-mortem findings of that time were as authentic as now.

The second period of the literature may be given as that from 1905 to 1910. In this period, we find numbers of cases reported, but the diagnosis has rested largely on the history and antispecific

treatment. The Wassermann reaction and the *x*-ray had not yet come into use.

Hausmann,⁶ in 1905, reported 2 cases showing a syphilitic history and improvement under treatment. As in other similar reports, the reasoning is loose and possibly fallacious—that while stomach symptoms may have been present in those individuals suffering from syphilis, it does not follow that improvement after treatment established the presence of a stomach lesion. In the same way, when the sufferers from tuberculosis or cardiorenal disease lose their digestive symptoms after rest and treatment, we do not conclude that there had been an organic lesion of the stomach.

Chase,⁷ in 1906, in summarizing the literature, mentioned the previous writers, and in addition, Einhorn,⁸ who in 1900 reported 6 cases of organic disease of the stomach; also Hoover,⁹ in 1904, 3 cases of gastric syphilis. Chase concluded that the number of reports were increasing rapidly, but attempted to establish a better basis for luetic diagnosis, and summarized as follows:—

- (1) Evidence of syphilitic infection more than the mere statement of the patient.

- (2) Evidence of the existing disease elsewhere in the body.

- (3) Demonstrable lesions in the stomach. This would include a thorough clinical examination, although he did not as yet include the *x*-ray or serum tests.

- (4) Therapeutic improvement. He was also firm in establishing the principle that when in doubt the patient should receive treatment, even though the diagnosis could not be positively established.

Bird,¹⁰ in 1907, reported a most interesting proof of the fact that syphilis does involve the stomach. He operated upon a man with a mass at the pylorus, but found a large gumma in the liver, and markings on the omentum. The patient was sewed up, and antisyphilitic treatment vigorously inaugurated. Due to some breaking of the stitches twelve days later, he had to again explore the wound, and on opening found the pylorus to be almost normal. He makes, like others, the broad statement that he had seen a number of syphilitic lesions of the stomach, but does not specify upon what grounds he made the diagnosis.

The third stage of the literature may be said to include that from 1910 to the present time. This is characterized by a number of reports of cases in which the Wassermann reaction and the *x*-ray have assisted in establishing the diagnosis. Syphilis is supposed to have been prevalent in Russia, but the literature at hand (Meshtsherski¹¹) is incomplete relative to gastro-intestinal lesions. He simply mentions that 9 out of their 406 cases reported suffered from severe indigestion. Malkoff,¹² and Diterikhns,¹³

in 1913, reported an hour-glass stomach, but did not attempt to be more exact in its etiology. *Progressive Medicine* (1914) mentions a communication from Wolpe,¹⁴ and Comite,¹⁵ to which the writer has not had access.

The writer has summarized the previous literature chiefly to show that it is an established fact that lues can involve the stomach. Moren, in 1911, in summarizing the literature, stated that the number of cases had greatly increased since 1892, at which time the Surgeon-General's library could show up only 6 cases.

From the writer's summary of the literature at the present time, in the Surgeon-General's library, Moren, was the first to mention the Wassermann reaction as an additional proof of the specificity of a lesion of the stomach.

Billings,¹⁶ in 1911, called attention to the manifestations of internal syphilis, and pointed out that associated with gumma we often find profuse sweats, with fever, resembling gall-bladder infection. It is chiefly interesting to note that he was willing to establish positively the diagnosis of syphilis of the internal organs, if, in addition to the history of the disease, and therapeutic improvement, he found a definitely positive Wassermann reaction.

As a basis for a report of the writer's 2 cases of hour-glass stomach, the literature showed but few cases where hour-glass had been attributed definitely to syphilis.

Beclere,¹⁷ in 1911, reported a case which he clearly established as one of syphilitic hour-glass. Patient, male, fifty-four years old, history of infection thirty-six years previous, and twenty-four years previous had a gumma on the leg. Had stomach symptoms for eleven years—chiefly that of a burning sensation—and his weight dropped off considerably. The usual stomach examination showed the characteristic separated balloons of hour-glass, and the roentgenogram confirmed the diagnosis. Operative treatment was decided upon but postponed, and specific treatment was inaugurated for a time. The constriction gradually disappeared, and he exhibits four roentgenograms, showing the gradual enlargement of the stricture, the final picture showing a stomach but little malformed anatomically, and evidently functioning perfectly.

Meyers,¹⁸ in 1912, reported a case, and, while he does not call it an hour-glass contraction, the description of the roentgenographic findings puts it in that class. This patient, male, aged twenty-two, syphilis five years previous, had had conscientious treatment for four years. For seven months there were stomach symptoms with loss in weight of 20 lb.; no vomiting, but distress lasting one-half to three-quarters of an hour after eating. He had a copper-colored ulcer near the left knee, night sweats, and slight cough. No positive evidence of tuberculosis. The Wassermann reaction was reported strongly positive. While under

observation, and within a period of two weeks, a mass, irregular in size, appeared high up in the epigastrium. The roentgenogram showed the stomach divided into two parts, the lower much larger than the upper. Treatment was instituted, and he rapidly returned to health. This writer carefully summarizes the pathology and symptomatology, and appends a table giving the names of authors and previous case-reports. In one of his conclusions he states that with localized evidence of stomach disease, and a strongly positive Wassermann reaction, the diagnosis is easy; that treatment should be instituted early, before hemorrhage has caused death, but does not mention whether cicatrization could be expected to improve under treatment or not.

Holitsch,¹⁹ in 1912, makes the most definite report which the writer has discovered in the literature. This is very similar to Case I described in this paper. Holitsch's case may be summarized briefly as follows:—Patient, a seamstress, aged thirty-three, had a hard ulcer on the labia ten years previous. She developed stomach symptoms which had increased over a period of six months, resulting in loss of weight, without cachexia. The chief symptoms were pain directly after eating, and a tender point high up in the epigastrium. Test-meal showed no free HCl, no blood, or lactic acid. The roentgenogram showed a definite hour-glass stomach, and the author shows the roentgenograms taken before operation, as well as after treatment. The Wassermann reaction proved to be strongly positive. At operation, the stomach was drawn up so high under the rib margin that the upper loculus could not be attached to the bowel; hence a simple jejunostomy was performed, sewing a tube into the bowel, through which the patient was fed. He described the stomach as being shrunken, and the wall thickened, chiefly in the submucosa. Some of the tissue was removed for microscopic examination. The results showed nothing indicating tuberculosis or carcinoma, but recalled "the well-known blood-vessel-wall changes seen in syphilis." In differential diagnosis, he points out that this shrinking could occur from the following pathological conditions:—

1. Phlegmonous gastritis.
2. Corrosive poisons.
3. Diffuse shrinking from carcinoma.
4. After the scarring of widespread ulceration of the stomach.
5. Through tuberculosis of the stomach.
6. Through interstitial gastritis.
7. Through syphilis.

The patient gained rapidly under antispecific treatment, and the tube later on was removed, and food was taken freely, in the normal manner. The author affirms the specificity of the lesion in this case, because of the strongly positive Wassermann reaction;

gain in weight of 23 kgrm. under treatment; visual demonstration that after treatment, the stenosed middle portion of the stomach widened out, permitting greater stomach capacity and function. The roentgenograms, establishing this, accompany the article.

Mills,²⁰ in 1913, reported a case of hour-glass stomach, with a roentgenogram, showing a massive infiltration of a large part of the stomach. He states that through a gastrojejunostomy and specific treatment, a complete restoration of the stomach shadow resulted.

With the assistance of our serum tests and the visualized evi-



Fig. 1.—Roentgenogram of Case I before operation.

- (a) Upper segment.
- (b) Lower stomach segment.
- (c) Fine line running out, indicating the connection between the two.

dence from the roentgenogram, are we in a position at the present time, definitely to state that an hour-glass stomach has been the result of syphilitic ulceration? There can be no doubt that the patient should receive the benefit of the doubt, and receive the treatment, in any case; but to answer the above question unreservedly in the affirmative is *still* impossible. These points will be emphasized in the following case reports:—

CASE I.—Mr. B., *æt.* forty, printer. Gave a history of stomach trouble for two years previous, and an old specific history, with indifferent treatment. Came to operation at the Mayo clinic, November 8th, 1913. “A Wetzel

jejunostomy was performed for a peculiar condition of the posterior wall and the pyloric end of the stomach, which looked like a series of ulcers, producing a ruffled condition of the organ, and narrowing the lumen to the size of a wrist. This condition may be syphilitic and it may be carcinoma. In view of the former, he is to get salvarsan." As in Holitsch's case, they found it impossible to do a gastro-enterostomy, and patient was fed under the directions of the writer, by the tube, in gradually increasing amounts, up to June 1st. In the meantime, he had received conscientious antispecific treatment, and his improvement has been marked. He has gained 30 lb., and has taken on a very healthy, hearty appearance. The Wassermann reaction, in spite of treatment, remains positive. Figs. 1 and 2 show the roentgenographic



Fig. 2.—Roentgenogram of Case II taken four months after operation. One of a series of pictures which shows a considerable stream of barium going down to the lower segment. Lower segment not shown here, but in other pictures; is the same form as in Fig. 1.

findings, a definite hour-glass constriction being apparent in each. Fig. 2 does not give a fair indication of the patient's improvement. It is true that the constriction is still definitely present, but the opening is sufficiently large, so that the patient can take reasonably solid food in moderation without any discomfort. The connecting portion between the two sections of the segments of the stomach is certainly larger than the lumen of the tube through which he had been fed for the several weeks. In all, he has received five doses of neosalvarsan, and two courses of mercury.

CASE II.—O., *æt.* thirty-five, bartender. Complained of his stomach for two and one-half years. Dull, boring pain, directly after eating. There was a definite tender point in the epigastrium, just to the left and 2 in. above the navel. There developed a tendency to vomit fifteen minutes after eating or

drinking, the vomiting always occurring without much nausea or distress. He was then put upon ulcer treatment, and after two or three weeks, began to improve, vomiting only occasionally. In this way, he continued for three or four months, when he again became worse, and lost weight rapidly. Another course of treatment, with sedatives as an alkaline powder, gave him a period of relief for a year. His trouble then again became acute, with more or less dull, continuous, griping pains in the stomach, with occasional vomiting. First x-ray examination was made February 28th, 1914 (Fig. 3). A specific history was denied, but at this time the Wassermann reaction was 3 plus positive. On this basis together with the x-ray findings, he was given anti-

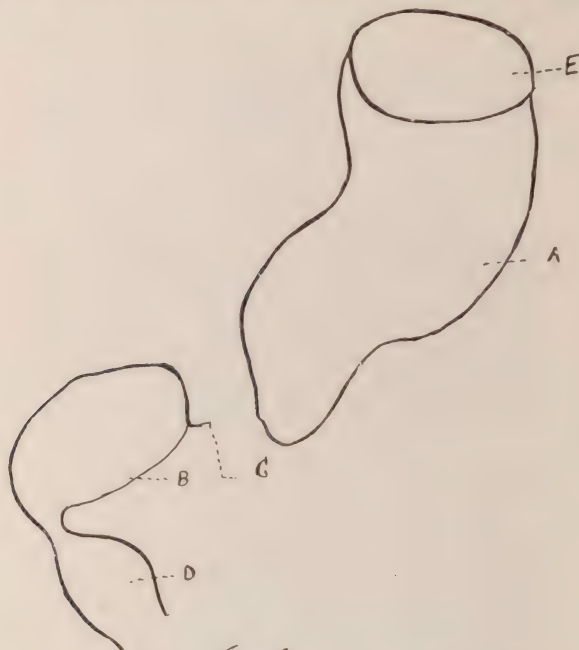


Fig 3.

Fig. 3.—Fluoroscopic tracing of Case II, taken at the time of the original examination.

- (a) Upper segment.
- (b) Lower segment.
- (c) Connection between the two. Detail could not be seen.
- (d) Loop of the duodenum drawn to the left and downward.
- (e) Gas bubble.

specific treatment, and nothing else. He received practically no directions as to diet, and took up his ordinary work promptly. His improvement has been most marked, and to date he has gained 25 lb. in weight, and is eating practically everything (Fig. 4).

No one can deny that these 2 cases have had lues, and that the disease was present actively; nor can it be denied that these cases show true hour-glass contraction of the stomach, proved repeatedly by consecutive examinations. These contractions have certainly been the result of ulceration, and are not malignancy or tuberculosis.

If it could positively be stated that antispecific treatment thoroughly overcame the cicatrization, this would seem to be the most positive proof of their specific nature. At the same time, it must be remembered that antispecific treatment will only change tissues in their plastic cellular stage, or stage of necrosis and destruction. We can in no way replace a defect in the palate or reform a saddle-nose, or overcome a stenosis of the rectum by medical treatment,



Fig. 4.—Roentgenogram of Case II, taken five months later. Material leaves the stomach very rapidly. In twenty minutes, note the large amount in the small bowel and even in the terminal ileum. As in other cases, the pyloric reflex would seem to be almost entirely lost. Note that in all 3 cases, the contours of the greater curvature of the upper segment are strikingly similar.

- (a) Upper segment.
- (b) Lower segment.
- (c) Connection between segments.
- (d) 'Chicken feet.' Material in small bowel.

but we can remove periosteal nodes from the tibia or surface of the skull, as has repeatedly been shown.

On practical grounds, we must all agree that syphilis does involve the stomach—that the gummatous or ulcerating tissue can cause scarring and shrinking—and that hour-glass stomach might theoretically occur. To go further, and state positively that syphilis alone does this in an individual case, independent of any other processes, premises an hypothesis which cannot be too cautiously

made. Holitsch would seem to have come the nearest to making it definitely positive, when he removed and made his histological report on some of the tissues, but it might be asked with reason, upon what grounds does he make his pathological diagnosis, and ask in what way the perivascular inflammation found could be clearly differentiated from other forms of ulceration, since the microscopical picture of syphilis is unfortunately indefinite.* The manifestations of visceral syphilis are being studied more and more, and we are in great danger, possibly, of confusing at times cause and effect. When such veteran observers in x-ray fields as Case, Carman, and George report that they have



Fig. 5.—Roentgenogram of Case III. A wide, diffuse shrinking. Both the upper and lower portions of the stomach well shown.

- (a) Upper segment.
- (b) Lower segment.

seen hour-glass conditions occasionally, which they thought might possibly prove to be syphilitic, it is well for others to be most cautious in interpreting the findings. It is for this reason that these 2 cases have been submitted, with a preliminary, condensed report of the clinical findings, and the striking benefits following upon treatment. They will be kept under observation, and the possible development of malignancy watched.

*The spirochetes should be looked for.

Prolonged observation should help further in proving the specificity of these lesions. At the best, the diagnosis of gastric ulcer is an anatomical and not an etiological diagnosis. More intensive knowledge of disease processes has already enabled us, conspicuously, to specify some of the types of heart disease, rather than to designate them simply as valvular defects. Probably the same will ultimately be done for stomach ulcerations, and in this line, it is well to remember that lues may be a factor in a certain unknown percentage of these cases. We have already in the gastro-intestinal tract well-known tendencies to syphilitic stenosis—stricture of the rectum and laryngeal stenosis. The particular diffuse shrinking, resulting in hour-glass stomach, might easily prove to be frequently due to syphilis.

The writer has recently observed another case, of which a roentgenogram of the stomach is now presented. His further history will be presented later.

CASE III.—Male, *æt.* forty-seven. Married. No children. No definite history of venereal disease. Complained for seven months of a burning pain in the stomach, practically all the time; increased by food; is worse immediately after eating. Frequent vomiting, regularly about 4 p. m., occasionally at night, containing portions of food. Vomiting is about the only relief he has had for his distress. There has been a loss in weight of 20 lb. He is very nervous, irritable, and fearful of cancer. Hemoglobin 95 per cent. Roentgenogram (Fig. 5) shows an hour-glass stomach. Motor meal shows a 'rest' of about one-third of the meal after six hours. Wassermann test taken following day after the roentgenogram, shows 4 plus positive. Patient has only been under treatment for three weeks. He has stopped vomiting, and has been able to take a considerable amount of semi-solid food. It is too early to note whether this form of treatment alone will suffice to relieve him or not.

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MESENTERIC GLAND TUBERCULOSIS.

By JOHN B. HAWES, 2nd, M. D., of Boston.

Mesenteric gland tuberculosis, or, as it is often and I believe unfortunately designated, *tabes mesenterica*, is looked upon as one of the unusual diseases. It is probably far more nearly the truth, however, that it is a very common condition. It is of special interest for two reasons: First, that the disease may reach a well-advanced stage with large masses of glands and yet produce no symptoms, and second, that it is only very rarely diagnosed prior to its discovery on opening the abdomen for some other cause.

At the Massachusetts General Hospital from the year 1900 to the present time, a period of nearly fourteen years, only thirty-two patients are entered on the records with a diagnosis of mesenteric gland tuberculosis. Although no very broad conclusions can be based on such a small number of cases, there are many points of interest to be found on a study of the signs and symptoms which were present. Nearly fifty per cent. of these cases occurred during the past three years. During the years 1900, 1901 and 1902 there were 4 cases, while in 1911, 1912 and 1913 the total was thirteen. This I presume is to be attributed to the increased interest and skill in diagnosis in all forms of tuberculosis during recent years. While the age of these patients extended from four months to fifty-eight years, there were only two over thirty-five years and 50 per cent. between the ages ten and twenty years. The disease, therefore, is apparently one of adolescence and puberty. There were twenty males and twelve females.

The diagnosis of mesenteric gland tuberculosis was made prior to operation in only three instances and in only one of these was it confirmed by operation. In the two other cases there was tuberculosis of the lungs or elsewhere, general glandular enlargement, or a mass in the abdomen which made the diagnosis comparatively easy. Sixteen patients were sent in for acute and three for chronic appendicitis, four for intestinal obstruction, while other diagnoses included movable kidney, pyelitis, chronic diarrhea, incarcerated hernia and pelvic abscess. There was no diagnosis in three instances. On a careful study of the records it is fair to state that in 5 cases mesenteric gland tuberculosis was considered a possibility. Of the 32 cases, 28 were operated on with one death, while 4 were discharged untreated.

Of the nineteen patients in whom appendicitis, acute or chronic,

was the preoperative diagnosis, the appendix was found to be normal in eight and tuberculous in one. In the remaining 10 cases there was a pathological condition of the appendix, while the enlarged glands were found purely by accident, having caused no symptoms. In only 6 out of the total number of cases did the patient's history or constitutional signs and symptoms suggest abdominal tuberculosis. In these 6 cases, gradual loss of weight and strength, exposure to tuberculosis, cough, tuberculosis elsewhere associated with abdominal symptoms occasionally acute but more often subacute or chronic, with or without a tumor, should have at least suggested the correct diagnosis. This diagnosis, therefore, always bearing in mind that in the majority of instances there are no symptoms and a diagnosis cannot be made beforehand, should be based on the following points:—

1. The disease is one of childhood and early youth.
2. Signs and symptoms of a systemic infection, such as loss of weight and strength, fever, rapid pulse, loss of appetite, undue fatigue, etc.
3. A tuberculous process elsewhere in lungs, glands, bones or joints, etc.
4. Abdominal symptoms, usually subacute or chronic, differing as to site of pain, tenderness, etc., from those of appendicitis.
5. A tumor usually only slightly tender and often more or less movable. The most common location of this tumor is to the right of the umbilicus.

Talbot has called attention to the presence of fat in the stools as a diagnostic point in this condition. In only one case out of this series was this fact noted. In infants or young children, especially, this is a bit of confirmatory evidence worthy of investigation. It is based on the presumption that the enlarged glands block up the lacteals and thus prevent the absorption of fat. The presence of fat in the stools is evidence in favor of this diagnosis; absence of such fat, however, should in no way interfere with making the diagnosis if other signs and symptoms are present.

The treatment of this condition may be divided into immediate operative and postoperative treatment. Of the two, the latter is by far the most important. In the great majority of the cases in this series there was no attempt to remove the enlarged glands. In a few cases the larger masses, which were causing or might cause obstruction, were excised; where the glands had softened and broken down they were curetted out and drained; in most instances they were left alone. The importance of postoperative treatment and supervision has been realized only during the last few years.

In the earlier records of these patients I find it occasionally written that the patient was advised to get plenty of fresh air,

good food, etc. At present all this is changed. While it is probable that in many instances the patient would continue in good health quite regardless of the tuberculous process in the mesenteric glands, it is not just or safe to take this for granted. For at least six months after the discovery of the glands, the patient should be kept under rigid observation and the best of hygiene. Tuberculin will at least help to prevent a further extension of the process and in many instances will decrease the size of the glands. Properly given, it can do no harm. This is the course pursued at the Massachusetts General Hospital. The patients in my clinic with this form of tuberculosis have invariably done well under such treatment.

In conclusion, I would emphasize the fact that in tuberculosis of the mesenteric glands, as with tuberculosis elsewhere, we are dealing with a systemic infection with a local manifestation. The most important part of treatment is that of the patient himself and not of his glands.

MEDICAL AND SURGICAL PROGRESS.

THE FREQUENCY OF TRANSITION OF ULCER OF THE STOMACH INTO CANCER.

A REVIEW OF RECENT LITERATURE.

By JEROME E. COOK, M. D., of the Editorial Staff.

1. Wilson and MacCarty (*Trans. Assoc. Amer. Phys.*, Vol. XXIV, 1909).
2. Paterson (*Lancet*, Vol. II, 1912).
3. Kocher (*Arch. fuer klin. Chir.*, Vol. 99, p. 397).
4. Aschoff (*Deutsch. med. Wochenschr.*, No. 11, 1912).
5. Billeter (*Beitræge zur klin. Chir.*, Vol. XC, Part II).
6. Busch (*Arch. fuer klin. Chir.*, Vol. 90, Part I).
7. Payr (*Arch. fuer klin. Chir.*, Vol. 92; *Wien. klin. Wochenschr.*, No. 9, 1910).
8. Albrecht (*Beitræge zur klin. Chir.*, Vol. 73, 1911).
9. Friedenwald (*Trans. Amer. Gastro-Enterol. Assoc.*, 1913).
10. Smithies (*Ibid.*).
11. Hauser (*Muench. med. Wochenschr.*, No. 23, 1910).

Scarcely any subject in medicine has been favored with such widely differing views as that of the etiological relationship of gastric ulcer to gastric cancer. Unlike many other disputed points, this one is not concerned mainly with theoretical considerations, nor would its solution give an answer to some merely technical or abstruse problem. On the contrary, the question under discussion deals with tangible factors, the interpretation of which might seem to offer little difficulty, and the final verdict would decide the important choice between two quite different modes of therapeutic effort. For if gastric ulcer frequently assumes a malignant character, it ought to be dealt with in a far more radical manner than if this transition were rare or exceptional; it would mean that the so-called medical treatment of ulcer were scarcely justifiable, and that in the surgical treatment the more radical procedure of excision of the ulcer or resection of the ulcer-bearing part were distinctly to be preferred to the usual simple gastro-enterostomy.

In reviewing the recent literature which has appeared upon the subject, it would seem useless merely to quote the widely differing views without attempting to give some sort of critical comment in an effort to arrive a bit nearer to a conclusion. If we look at the problem with this purpose in mind, we shall find that the various investigators may be (roughly speaking) divided into two camps,

according to the methods which they pursue and the conclusions which they reach. On the one side are those who view the question from the standpoint of the clinic, who make use of the clinical history, the course and final outcome both of the operative and the non-operative cases. On the other side the pathologists range themselves,—those who from the gross and microscopical evidence at operation and post-mortem arrive at an equally positive but quite different statement. It is true that the pathologists appeal to the clinical histories and that the clinicians are not unwilling to cite evidence from the laboratory, but, in the main, their data are along the lines indicated.

The pathologists (and among these are included all those who follow the pathological method) are agreed that cancer is quite regularly preceded by ulcer; that ulcer very frequently undergoes cancerous change; that stomach ulcer, so diagnosed, is a surgical affection and should be dealt with more or less radically. Probably not more than 2 per cent. of gastric cancers are not preceded by ulcer in the opinion of Wilson and MacCarty. Of the cases reported by Smithies, 41.8 per cent. were on an ulcer basis, while Payr reports that about 25 per cent. of the callous ulcers upon which he operated showed carcinomatous change.

The clinicians, on the other hand, assert that the cancerous degeneration of a stomach ulcer is a rare occurrence, so rare in fact that when a known ulcer can develop cancer it would not be illogical to suppose that the cancer had developed entirely independent of the ulcer. Friedenwald is less extreme in his view, although from his analysis of 1,000 cases of cancer not more than 7.3 per cent. gave a history which could be laid to ulcer. Busch, from his operations of 76 cases of ulcer on which gastro-enterostomy was performed, concludes that in less than 3 per cent. of the cases one must fear a malignant change. To urge resection on account of the danger of malignant degeneration seems unwarranted, says Albrecht, who has followed the post-operative history of 30 cases of ulcer from four months to twelve years. Billeter has examined the cases in the Kroenlein clinic which have been operated upon for gastric ulcer between 1888 and 1910. Of 122 cases which could be suitably followed, 2 developed cancer, four and eleven years respectively, after operation. The eleven-year case was entirely free from stomach symptoms during the interval between the operation and the development of cancer. Two of the 65 ulcer cases operated upon by Kocher (gastro-enterostomy) died of cancer. Both died a short time after operation. A cancer was suspected even before the operation, but the macroscopical appearance of the ulcer seemed not to warrant resection.

As has been pointed out by Hemmeter, the two statements that "most gastric cancers develop on an ulcer basis," and that "very few ulcers become cancers," are not mutually antagonistic. It need only be assumed that stomach ulcer is many times more frequent than stomach cancer, to make both statements mathematically possible. It appears that thus far no one has attempted to treat the subject from the side of the relative frequency of the two conditions in its bearing upon the point under discussion.

Great stress has been laid upon the frequency with which cancer cases give a history of previous stomach trouble of long duration. Most authors agree that such a history is obtainable in a

considerable percentage of cases, although Friedenwald found histories of entire freedom from gastric symptoms in all but 23 per cent. of his cases, while in not more than a third of these did the history indicate ulcer. The weakness in this entire train of argument lies in the fact that it assumes to diagnose the presence or absence of gastric ulcer from the history alone. Here we are on very unsafe ground, and there is little wonder that each side has made use of this method with quite opposite results. If we review the status of the gastric ulcer question during the past fifteen years, recalling the fact that many cases formerly called ulcer on account of the history might now with good reason be attributed to disease of the appendix, gall-bladder, or some other organ; if, moreover, we remember that only at a comparatively recent date was the relative frequency of duodenal ulcer as compared with gastric ulcer recognized, we shall probably give considerable heed to the statement of Paterson, that while it may be possible to diagnose duodenal ulcer from the history alone, this is quite impossible in the case of gastric ulcer.

If then, we can place little reliance upon the clinical history as it bears upon the point at issue, may we not find in the report of the microscopist a more certain and, therefore, more valuable criterion as to the development of cancer on the bases of ulcer? Wilson and MacCarty, in examining 153 cases of undoubted cancer, concluded that 109 (71 per cent.) presented sufficient gross and microscopic evidence of previous ulcer to warrant placing them in a group labeled, 'carcinoma developing on previous ulcer.' This conclusion is hotly attacked by various writers, particularly as to the ability to determine histologically with certainty the development of cancer on an ulcer basis. However, while they incline to the opinion that cancer often develops on an ulcer basis, they acknowledge that most of the histological evidence which has been offered to prove the point will not stand criticism.

Paterson denies that the presence of scar tissue in the cancer denotes previous ulcer formation, stating that cancer itself can give rise to scar formation. It seems rather certain, moreover, that Payr, in his efforts to prove the ulcer origin of cancer, has proved a bit too much for his own cause. In about 25 per cent. of callous ulcers, he found histologically carcinomatous change, "although the macroscopic appearance did not reveal it more were there metastases in the lymphatics."

Now it is quite certain that 25 per cent. of ulcers as they are met with at operation are not already cancerous. None of the many observers who have followed ulcer cases, demonstrated as such at operation, over a period of years, reports anything like a mortality of 25 per cent. One to 3 per cent. (as high as 6 per cent. by the older writers) is the highest incidence reported by these observers. Nor would the view of Smithies that gastro-enterostomy diminished the tendency to cancer formation explain the statement of Payr, unless he go further and assume that gastro-enterostomy not only prevents the incidence of cancer, but that it is able to cure cancer already demonstrable as such under the microscope.

To sum up then, the case for the 'transitionists' presents itself in about the following manner: A large percentage of cancer cases give a previous ulcer history. A large number of cancers seem microscopically to develop on an ulcer base; a large number of

apparently simple ulcers show microscopic evidence of cancer. The validity of all these claims is quite generally contested, and the accuracy of methods by which the conclusions are reached is strongly questioned. On the other hand, the 'non-transitionists' point to large numbers of cases of ulcer, demonstrated beyond a doubt, which have shown only a small percentage of malignant change, and that this has been the experience of most surgeons is attested by the fact that gastro-enterostomy still remains the operation generally practised in these cases. Were the claims of the 'transitionists' true, the operation would have been long abandoned as unsatisfactory. We shall therefore have to dismiss the case of the frequent transition of ulcer into cancer as not proved.

DIAGNOSTIC AND THERAPEUTIC NOTES.

GALL-STONES AND GASTRIC JUICE.—Von Aldor (*Wien. klin. Wochenschr.*, No. 18, 1914). Cholelithiasis may occur with hyperacidity, subacidity or normal gastric acidity. Its non-surgical treatment should depend primarily upon the gastric findings. The gall-bladder is not a mere reservoir but exerts reflexly a definite influence upon gastric secretion. Thus it has been found that extirpation of the gall-bladder is followed by permanent gastric subacidity or anacidity. Accordingly, the gastric subacidity that is so frequent an accompaniment of cholelithiasis may be due to either of two causes, a reflex from the gall-bladder or a chronic gastritis. The latter condition is characterized by the presence of much mucus in the gastric contents and by a progressive fall in the amount of hydrochloric acid present. Such patients usually do not have extremely violent attacks of colic, but, on account of their gastritis, are never entirely free from pain. Dietetic indiscretions usually lead to a paroxysm. The other group of cases is usually due to a coli infection of the gall-bladder without gastric involvement. The attacks of colic are here very severe but with symptom-free intervals. Mucous colitis with constipation, diarrhea, meteorism, etc. are common. Therapeutically both groups of cases demand a diet consisting of milk, eggs and vegetables. Hydrochloric acid may be given by mouth and large quantities of water per rectum. Gastric lavage is indicated only in the cases complicated by gastric catarrh.

GASTRIC CANCER WITH ACUTE ONSET.—Goodman (*Arch. Diag.*, April, 1914). The general conception of gastric cancer is that it is a disease of long standing, with pain as a characteristic symptom. Its frequent painlessness has been emphasized by a number of writers. The frequency of an acute onset of gastric cancer is not yet generally appreciated. The writer reports 12 cases in which the diagnosis of gastric cancer was made in from two days to two months after the beginning of symptoms of stomach trouble. He urges exploratory incision in all individuals of middle life who furnish a history of previously good digestion with a sudden and persistent attack of gastric distress, or who complain of a sudden increase of gastric symptoms, with no amelioration of the same under appropriate medication and dietetics.

OCCULT BLOOD IN GASTRIC ULCER.—Boas (*Deutsch. med. Wochenschr.*, No. 23, 1914). The most important sign in the diagnosis of gastric or duodenal ulcer is the presence of occult blood in the

stool. A persistently positive reaction, in the presence of the usual symptom-complex, proves the existence of a florid ulcer; a constantly negative blood test speaks against the presence of an active ulcer but not against the existence of a healed ulcer, with all the sequelæ that come in its train. For these tests the old guaiac or benzin tests are not sufficiently delicate. The phenolphthalein test, according to Boas, is the only one capable of showing the presence of minimal traces of blood in the feces. By its means an early diagnosis is made possible and relapses can be recognized with certainty. The combination of the test with an oil breakfast enables one to distinguish between gastric and duodenal ulcer. The gastric contents having been found free from blood, a number of ounces of olive oil are put into the stomach. Thereby a regurgitation of duodenal contents into the stomach is brought about. The oil is then expressed through the stomach tube and tested for blood. A positive reaction speaks for duodenal ulcer, provided the stomach tube was manipulated so gently as to minimize the possibility of traumatic bleeding.

RADIOGRAPHY OF ABDOMINAL VISCERA.—Rautenberg (*Deutsch. med. Wochenschr.*, No. 24, 1914). Hitherto it has not been possible to obtain x-ray pictures of the liver and spleen or of the lower surface of the diaphragm. Such pictures can, however, readily be obtained after injecting sterile oxygen into the peritoneal cavity. Both liver and spleen then stand out well on the plate, and the abdominal border of the diaphragm becomes distinctly visible. The method facilitates the early diagnosis of hepatic cirrhosis; adhesions and tumors can be made out so clearly as often to render an exploratory laparotomy unnecessary. No ill results have ever been observed.

JEJUNAL ULCER FOLLOWING GASTRO-ENTEROSTOMY.—Schwarz (*Arch. fuer klin. Chir.*, Vol. 104, Part 3). Of 146 cases of jejunal ulcer following gastro-enterostomy, that came to operation, 36 died, 30 were not benefited, and 80 permanently cured. The great majority of recurrences occur in men, probably because of their use of alcohol and nearly all occur in anterior gastro-enterostomies, in those with a long loop, or in those done by the Y-method of Roux. Jejunal ulcers rarely form after posterior gastro-enterostomies with a short loop, because here the alkaline duodenal contents readily enter the stomach and neutralize the excessive acidity of the gastric juice. When jejunal ulcers have formed, Schwarz advises separating the gastro-enterostomy loop from the stomach, closing the two openings and performing a new short loop posterior gastro-enterostomy, being careful to suture the mucosæ with fine catgut.

INDICATIONS FOR THE OPERATIVE TREATMENT OF GASTRIC ULCER.—Payr (*Zentralbl. fuer Chir.*, No. 25, 1914). Only the simple gastric ulcer, without extensive thickening, the ulcer that is clinically manifest but cannot be found at operation, the duodenal ulcer, and,

finally, the classical pyloric stenosis due to ulcer scar, should be treated by means of gastro-enterostomy. The writer, one of the leading German surgeons, expresses emphatically the conviction that every callous gastric ulcer and every ulcer that has formed a tumor should be resected, if the patient's condition at all permits such a step. The basis of this conviction is his observation that a large proportion of such ulcers are or become carcinomatous.

THE MEDICINAL TREATMENT OF DIARRHEA.—Henius (*Deutsch. med. Wochenschr.*, No. 30, 1914). Bergmann was the first to demonstrate the relationship of the stomach to peristalsis of the large gut. By means of a window in the abdominal wall of a rabbit, he was able to note the occurrence of colonic peristalsis whenever food was introduced into the stomach. Fuld, some time ago, showed that persistent diarrhea was often due to irritation of the gastric mucosa, acting by what he called "the gastro-colic reflex." Such diarrheas promptly ceased when the gastric mucosa was anesthetized by means of cocaine. This may be prescribed as a 3 per cent. solution, of which 10 drops should be given, three times daily, a quarter of an hour before meals. A better method is to give the cocaine in tablet form as its effect is thereby concentrated upon the stomach. Such tablets should contain $1/12$ gr. cocaine each; the dose for adults is 3 tablets, three times daily, a quarter of an hour before meals; for children, $1/4$ to 1 tablet. The tablets must be very soluble, a property which the writer praises in the so-called 'gelonida neur-enterica.' The treatment is especially useful in the nervous diarrheas and in the summer diarrheas, that persist after the offending ingesta have been removed.

BOOK REVIEWS.

ABDOMINAL SURGERY. Clinical Lectures for Students and Physicians. By Thorkild Rovsing, Professor of Clinical Surgery at the University of Copenhagen. Edited by Paul Monroe Pilcher, A. M., M. D., Brooklyn, New York. Philadelphia and London: J. B. Lippincott Company. 1914. Price, \$5.00.

These clinical lectures by Rovsing fulfil exactly the purpose for which their author intended them—namely, that of emphasizing the importance of clinical lectures in the teaching of medicine. One lays the book down with a very definite and concrete notion of Rovsing's method of clinical analysis and with a fairly clear picture of the Rovsing clinic as a whole. When this has been said, the greatest praise has been given a book.

There are twenty-five chapters in all. The first four are devoted to general principles of clinical surgery, antiseptic and aseptic methods and anesthetics, and the remaining twenty-one to the various phases of surgery of the esophagus, stomach, liver and duodenum.

If we bar the subject of gastroptosis, we may say that the views expounded by Rovsing are representative of the commonly accepted doctrines that reign to-day. As we had every reason to expect, from Rovsing's contributions to current literature, we find him placing much stress on gastroptosis as provocative of grave abdominal disturbance, and equally marked stress on operative cures after gastric fixation by his method. He presents his data in such fashion as to make a strong case, not marred by distasteful dogmatism.

It is rather startling to hear Rovsing vehemently contradict the old accepted doctrine that ether narcosis is contraindicated by acute and chronic pulmonary inflammations. He not only does this, but suggests that ether is helpful in asthma, emphysema and bronchitis, and, moreover, that we may be on the threshold of a therapeutic era in which these diseases will be treated by ether inhalations, "as a fitting rebuke to those surgeons who have unjustly charged that ether has an injurious effect on the air-passages."

The translation is, on the whole, excellently done by Pilcher, the only criticism being that the style is stilted at times by adhering too much to the Latinisms of the original. For instance, a fractured arm is described as a "fractured crus," (p. 36), an intoxicated patient is described as "ebrious" (p. 361), and the suturing of an incision is described as "rejoining the incision."

MODERN SURGERY. General and Operative. By John Chalmers DaCosta, M. D., LL. D., Samuel D. Gross Professor of Surgery, Jefferson Medical College, Philadelphia, etc. etc. Seventh Edition, Revised, Enlarged, and Reset with 1,085 Illustrations, Some of Them in Colors. Philadelphia: W. B. Saunders Company. 1914. Price, \$7.50.

Of all the new editions of old books that come to the reviewer's table, none is more welcome than the successive editions of DaCosta's "Surgery." The fact that we have reviewed the work favorably, and that it has won for itself so secure a place as a surgical staple, makes us feel that, even considering the added excellences of the enlarged volume, a detailed review is hardly called for.

The arrangement of the volume follows the lines laid down by previous editions. By widening and lengthening the pages, the publishers have succeeded in adding some two hundred and fifty pages of material, without noticeably increasing the bulk of the book. It is very essential that artifices of this sort should be practised, for not the least valuable factor in the success of this book is to be found in DaCosta's ability to condense his material into one volume of handy size.

Among the additions deserving special mention are the pages devoted to vaccines and serum therapy, the restatement of Crile's anoci-association theory of shock, the description of so-called shockless operations, the discussion on radium, and the lucid account, in the light of modern research, of the rôle of the more important ductless glands.

For the student, the volume is an almost essential vade-mecum, and for the real lover of medical literature, this last edition will be found to be a particularly valuable possession, if for no other reason than for its charming preface.

A MANUAL OF AUSCULTATION AND PERCUSSION. Embracing the Physical Diagnosis of Diseases of the Lungs and Heart and of Thoracic Aneurysm and of Other Parts. By Austin Flint, M. D., LL. D., Late Professor of the Principles and Practice of Medicine and of Clinical Medicine in the Bellevue Hospital Medical College, etc. Sixth Edition, Revised and Enlarged by Haven Emerson, A. M., M. D., Associate in Physiology and Associate in Medicine, College of Physicians and Surgeons of Columbia University, etc. Illustrated. Philadelphia: Lea and Febiger. 1912.

Through his description of the peculiar murmur found in aortic regurgitation, which is generally accorded the name of 'Flint murmur,' the name of Austin Flint has become inseparably connected with the art of physical diagnosis. It is gratifying that the work of this master of physical diagnostic methods should remain at the disposal of the students of medicine of succeeding generations. The editor of the present edition, besides adding several valuable footnotes, and incorporating in the text the results of recent accessions to our physical diagnostic knowledge, has written two additional chapters on the examination of the abdominal viscera and of the nervous system.

In the chapter on percussion a few words on the value of the so-called 'threshold percussion' would not have been inappropriate, and in describing the paravertebral triangle of dullness as a sign in pleural effusions the editor would not have erred in giving credit to Grocco, its originator, for the sign has gained widespread recognition as 'Grocco's sign.'

ANESTHETICS, THEIR USES AND ADMINISTRATION. By Dudley Wilmot Buxton, M. D., B. S., M. R. C. P., Sometime President of the Society of Anaesthetists, etc. etc. Fifth Edition. Philadelphia: P. Blakiston's Son and Co. 1914. Price, \$3.00.

This, the fifth edition of Buxton's work on "Anesthetics" has been improved along two lines; in the first place, much of the volume has been rewritten, and secondly, what is more important, much of the dead wood of the previous edition has been cut out. The result is that the volume remains, in the opinion of the reviewer, one of the best books written on the subject of anesthetics.

After a short historical chapter, Buxton discusses, in order, Preparation for Anesthesia, Nitrous Oxide, Ether and Hedonal, Chloroform, Ethyl Chloride and Its Mixtures, Alkaloidal Drugs with General Anesthetics, Anesthetics in Special Surgery, Anesthetics in Obstetrics, Accidents and After-Effects of Anesthesia, Local Anesthesia, and Medicolegal Aspects of Anesthesia.

The volume is well and discriminatingly illustrated.

BEDSIDE HEMATOLOGY. An Introduction to the Clinical Study of the So-Called Blood Diseases and of Allied Disorders. By Gordon R. Ward, M. D. (Lond.), F. R. S. M., etc. Illustrated. Philadelphia and London: W. B. Saunders Company. 1914. Price, \$3.50.

The great merit of Ward's book, especially from the point of view of the practitioner, is that it approaches the subject rather from the clinical than from the laboratory standpoint. Each disease, characterized by blood changes, is discussed from all points of view and the hematological aspect of the condition given only its due prominence. The technical chapter is very brief and for more detailed information other textbooks must be consulted. A certain amount of dogmatism was perhaps unavoidable, but not to the extent practised by the author. To mention one instance from among many, it is altogether misleading to state that malignant endocarditis is always associated with a leucocytosis. Blood cultures and hematozoa are entirely omitted from consideration.

LES EPANCHEMENTS DU PERICARDE. Etude Clinique et Thérapeutique. La Ponction épigastrique de Marfan. Par le Docteur Germain Blechmann, Ancien interne en médecine des Hôpitaux de Paris, etc. etc. Paris: J. B. Baillière et Fils, éditeurs. 1913.

Few diseases receive so unsatisfactory a treatment in even the best textbooks as pericardial effusion. The publication of a careful and exhaustive monograph on this subject is, therefore, to be welcomed. The author discusses all the various forms and varieties of pericardial effusion in detail, with special reference to diagnosis and therapeutics, and illustrates his text

interestingly by means of appropriate clinical history. He describes in detail Marfan's epigastric route for puncturing the pericardium, a method too little known but destined to replace all others. The book, in common with most French publications, has what would be considered an unpardonable fault in an English or German textbook, the total lack of a subject index.

FORMULAIRE DES MEDICATIONS NOUVELLES ET DES TRAITEMENTS NOUVEAUX POUR 1914. Par Le Dr. H. Gillet, Ancien Interne des Hôpitaux de Paris, Chef de Service à la Polyclinique de Paris. Neuvième Edition entièrement Refondue. Paris: J. B. Baillière et Fils. 1914.

Each year, great numbers of therapeutic suggestions appear in the journals, some of which are soon forgotten, while others remain as permanent acquisitions. Gillet's booklet, which appears each year, presents in alphabetic order and without criticism, a brief but sufficient account of each new method of treatment that has appeared during the past year. Many of the suggestions are sufficiently bizarre; others will appeal at once to the reader as worth trying. Nowhere else, so far as we know, can this vast material be found in the compass of one small volume. The booklet should be of great value, but only to the critical reader.

BLOOD-PRESSURE IN MEDICINE AND SURGERY. A Guide for Students and Practitioners. By Edward H. Goodman, M. D., Associate in Medicine in the University of Pennsylvania. Illustrated. Philadelphia: Lea and Febiger. 1914. Price, \$1.50.

This is the best manual of blood-pressure in the English language. After a discussion of the physiology of blood-pressure and of the technique of estimating it, the various conditions characterized by hypertension or hypotension are taken up in detail. The chapter on the auscultatory method is especially to be commended. Perhaps the kinetic study of the circulation does not receive sufficient attention, which is the more to be regretted as future work will probably be chiefly along this line. Still this is not strictly a matter of pressure and this after all justifies its nearly complete exclusion from the book.

PHYSIOLOGY. A Manual for Students and Practitioners. By A. E. Guenther, Ph. D., Professor of Physiology in the University of Nebraska and Theodore C. Guenther, M. D., Attending Physician, Norwegian Hospital, and Visiting Physician, Tuberculosis Clinic of the Bay Ridge Hospital. Brooklyn, N. Y. Second Edition, Thoroughly Revised. Illustrated. Philadelphia: Lea and Febiger. 1912.

This book does not pretend to take the place of the more elaborate textbooks of physiology. Its purpose is rather to lay stress upon the essentials of the subject so that the student might quickly gather together for review the points of paramount interest. Each chapter is followed by a series of questions dealing with the subject-matter of that chapter to be used as a quiz. The book is well adapted for its intended purpose.

L'ERYTHREMIE (MALADIE DE VAQUEZ). Par Le Dr. R. Lutembacher, Ancien Interne des Hôpitaux, Chef de Laboratoire à la Faculté. Paris: Masson et Cie. 1914. Price, 1 fr. 25.

In 1892, Vaquez described a disease characterized by cyanosis, distension of the superficial villus and a marked splenomegaly. The patients usually complain of pain in the arms and legs and of vasomotor crises. The blood uniformly shows a great increase in the number of red cells. The extensive literature on this condition is adequately discussed in brief compass, an unusual degree of recognition being extended to American work.

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EDITORIAL.

LOUVAIN AND ANDREAS VESALIUS.

It would not be meet at this time to enter into a discussion as to the real reasons why so famous a university as that of Louvain was destroyed in the present war, but all scholars must bemoan the fact that this calamity, this blow to culture has occurred. What student of the history of medicine has not lovingly referred, time and again, to the venerable pile of stone which typifies the University of Louvain or has not visited it for the sake of the reputation of one man—Andreas Vesalius. Let us hope that in the future when the jars and wranglings that are besetting the world at present are less virulent, when the sanity of outlook again asserts itself, when men shall write with their mind's content undisturbed, the regret at the destruction of this university will only be that of the inevitable loss of a dear friend. In the meanwhile let us read and reread that striking essay on Vesalius—"Anatomy In Long Clothes"—from the pen of Henry Morley, himself a physician and a writer of no mean parts, which first saw the light of day in *Fraser's Magazine*, November, 1853. And it is in the hope that the classical prose of this now almost forgotten essay will revive an interest in Vesalius and bring to the notice of the medical men of this country the great loss of a historic building, that the following lines are quoted:—

"There is an old folio, known to most men who have visited the fountain-heads of medical literature, and dear to bookworms for its woodcut illustrations, which in their own time were ascribed to Titian. It is the *Corporis Humani Fabrica* of Andreas Vesalius. The first page is adorned with a large and spirited woodcut, in which a young man, wearing professor's robes, is to be seen standing at the table of a lecture theatre, and pointing out from a robust subject that lies before him the inner secrets of the human body. The

tiers of benches that surround the lecture-table are completely crowded with grave doctors, who are leaning forward, struggling to see, and even climbing upon railings, from which they look down with faces that present a striking group, expressive of much wonder, interest, and curiosity, mixed with a little awe. And yet they look upon a spectacle which is presented in our day as a matter-of-course to thousands of young men during the winter session at the hospitals.

"The woodcut at once leads us to suppose that we have to deal in the book to which it is prefixed with a man who was the first to force his way into a path obstructed by a heavy barricade of prejudice. If we turn over a leaf, we find his portrait in another sketch, rough, bold, and masterly. It portrays spirit and flesh of a young man who has the marks of a hardworking brain upon his forehead, and of a firm will upon his face. He looks like a man born to do work for the world, and not unwilling at the same time to take ease in it. He evidently can enjoy as well as think, and will, and do. His beard is very trim, his senses look acute, his rather handsome features express much refinement, aptness also for a look of scorn. He shows like a chief in intellect, a gracious king over some region of knowledge, who possesses all he could inherit, and knows how to conquer more; a good companion to kindred minds when recognized among them as a leader. So we judge from the noble portrait of the young professor in his robes, Andreas Vesalius, aged, as we are told by the inscription on the border, twenty-eight; a man who at that age had already become the Luther of Anatomy.

"We meet only occasionally with born poets and musicians. Vesalius had a native genius of a rarer kind—he was a born dissector. From the inspection of rats, moles, dogs, cats, monkeys, his mind rose, impatient of restraint, to a desire for a more exact knowledge than they or Galen gave of the anatomy of man. But in his day, to be dissatisfied with Galen was to be a heretic in medicine; and to touch with a scalpel the dead 'image of God' was reckoned impious in theology. There was no doubt left upon that latter point, for in the lifetime of Vesalius Charles the Fifth had brought the question formally before a consultation of divines at Salamanca. For purposes of ambition, living men might be blown asunder at the cannon's mouth, cut up with sword and axe, or probed into with military lances. For the purposes of science dead men were not to receive a wound.

"Three weasels formed the family arms of Andreas, whose name was properly Wesalius, his forefathers having at one time belonged to Wessel, where they formed a portion of the noble Wittag family. The immediate progenitors of Andreas for several generations had been eminent for medical attainments. Peter Wesalius was a famous physician; John the son of Peter, another thriving doctor, had been physician to Mary of Burgundy, the first wife of Maximilian I. John, growing old, had retired from business, not, however, until he had introduced Everard, his son to his distinguished mistress, and to all his profitable practice. John, in retirement at Louvain, had written verses and enjoyed much honour: men of learning dedicated books to him. Everard had kept up the reputation of the family, had written Commentaries on the books of Rhases, and upon the Aphorisms of Hippocrates. The son of Everard, and the father of Andreas, enjoyed another reputation of

the same kind: he was apothecary to the Emperor. The whole blood of the house was tintured by this hereditary transmission through five generations of the same pursuit. When Andreas and his brother Francisco were destined to follow the two separate professions of medicine and law, their father found it very difficult to keep Francisco steady to his course of jurisprudence. Sending him out to study law his father found to be like throwing a ball against a blank wall, he came regularly back upon his hand. When afterwards Francisco saw his famous brother very much attacked by Galenists, and indisposed to pay attention to them, there was nothing nearer to the heart of the young lawyer than a desire to fight his battles for him. The veins of the family, in fact, ran medicine. Andreas, when he was not fifteen years old, attended plague cases, and practised surgery.

"The toils and trials of an anatomical enthusiast who did his own dark deeds, and begot light of them, three centuries ago, before the very threshold of the Inquisition, form a pleasant chapter in the history of modern science. But since it is a chapter very seldom read, we have considered it worth while to collect together its essential details, chiefly from the narrative of Boerhaave and Albinus, partly from certain dustier and older men, whose company is good because, although they are upon the whole unquestionably tedious, they often have quaint facts to tell about the days in which they had their pleasure.

"Andreas Vesalius was born on the last day of December, in the year 1514. His father, the apothecary, being attached to the service of Margaret, governor of the Netherlands, aunt of the Emperor Charles the Fifth, Andrew was born at Brussels. He was sent as a boy to study at Louvain, where he made very rapid progress in all branches of knowledge taught to him. He manifested a great taste for science, and spent all his leisure upon practical research into the mechanism of the lower animals. He became very proficient in the scholarship of the day, so that in his great work, written before he had allowed his skill to rust, the Latin style is singularly pure. Riolanus, who took pains afterwards to show that Vesalius was but a shallow fellow, and that his knowledge of anatomy in particular was not much more than skin-deep, protested that he must have found some good scholar to write the Latin of his books. At the same time, however, that he might smite with a two-edged sword, the envious critic blamed the sentences of his opponent for their length, and its style for its obscurity; laying the law down, be it noted, in a style of his own ridiculously barbarous and complicated. The good Latin written by Vesalius while he was comparatively fresh from his studies at Louvain, became corrupted by disuse. The stagnant atmosphere of an Imperial court favoured the rotting of his scholarship. That Vesalius mastered not only Latin but Greek also, accurately, at Louvain, may be inferred from the fact that he wrote Greek annotations to the works of Galen. It is more certainly proved by the confidence with which the great Venetian printer, Aldinus Junta, in after years made application to Vesalius alone for a corrected text of Galen, and for castigation of a Latin rendering of Galen's works. The application was in part only responded to.

"Greek and Latin were sources of pleasure to the young anatomist only because they enabled him to read medical books. Then also,

as he soon discovered the corruptness of translations generally, he was not content to study the Arabians by aid of their interpreters, but betook himself to a scholar learned in Arabic and Hebrew, Lazarus Hebræus de Frigeis. With that teacher he read Avicenna in the original Arabic, and afterwards was able to write for himself a paraphrase of the ten books of Rhases to the Emir Almansor.

"From Louvain the youth was sent to Paris, where he studied physic under a most eminent physician, Jacobus Sylvius, otherwise Jacques de la Boë. Sylvius found his new pupil disagreeably acute. It was the practice of that illustrious Professor to read to his class Galen on the Use of Parts. He began fairly, and when he had reached the middle of the first book, at the point where the anatomy commences, he said, 'Gentlemen, we now come to a part too difficult for the comprehension of beginners. Were I to go through it with you, we would only be bewildering each other.' To save trouble, therefore, the Professor took a flying leap over all intervening matter, and descended on the fifth book, through which he cantered quietly to the tenth section. From the rest of the work he made selections, to the consideration of which he either gave a single lecture, or to which he devoted five or six lessons at most. This course of professional study was illustrated sometimes with the dissection of some portion of a dog, prepared for the purpose by a surgeon under the Professor's eye. This always was thrown away on the third day, when it became unpleasant to the smell.

"Sylvius believed, like his brethren, that the anatomy of all flesh was contained in Galen. If he found anything in his dog that puzzled him, the fault lay always with the animal; the dog was wrong. Often the learned man—more used to turn over leaves of books than strips of muscle—blundered about his little preparation, vainly searching for some bloodvessel or tendon that he meant to show. At the third of his practical demonstrations witnessed by Andreas, the teacher was so much surprised at the confused construction of the animal before him that he called upon the newcomer, whose passion for dissecting was well known, to help him through his difficulty. The professor's patience was tried further by the fact that Andreas Vesalius, by the intensity of his own enthusiasm, infected his companions with a pitiless zeal after correct details of anatomy. Whenever Sylvius, unable to find some vein or nerve, excused its non-appearance and passed glibly on, he made work for his pupils. They slipped down when he was gone, hunted the dog through for the missing part, dissected it out for their master with great neatness, and triumphantly called his attention to it on his next appearance.

"The influence of a commanding mind and of a strong enthusiasm was exercised over his associates in a yet more striking way by the ambitious student. He caused some of the young men to share his own impatience at the dog-anatomy to which they were confined. Pleasure loving youths, moved by his impulse, were to be found with him, haunting at ghostly hours the Cemetery of the Innocents. Once when he went with a fellow-pupil to the Montfaucon, where the bodies of executed criminals were deposited and bones were plentiful, they found themselves attacked by a pack of fierce dogs. Masters of the situation, they would by no means let a bone be

touched, and there ensued so hard a battle with them that the young anatomist believed the hour of fate was come. It seemed for a short time likely that, the tables being turned upon him, his own body would be dissected for the profit of that very class to which so many of his victims had belonged.

"Another of the teachers under whom Andreas studied in Paris was a man of great renown, Gauthier d'Andernach, or to speak learnedly, Guintherius. He was physician in ordinary to King Francis I. Guintherius, before he went to Paris, had been Greek Professor at Louvain. At Paris he occasionally ventured so far as to dissect human beings. We run over three years to state here that in his *Institutiones Anatomicæ*, published in 1536, Guinther took occasion to specify Andreas Vesalius (the classic V had not at that time been adopted in the name) as a youth of great promise, Vesalius then being twenty-one years old. Again, after three more years had elapsed, in publishing a new edition of his *Institutiones*, Guinther stated that he had been indebted largely to the helping hand of Andreas Vesalius, a youth most diligent in the study of Anatomy. The youth was then already himself beginning work upon a book that was to produce a revolution in the science.

"At about the age of nineteen, however, the pupilage of Andreas, at Paris, under Sylvius and Guinther, had been broken off by the French wars. He retired then to his alma mater at Louvain. Here continuing his studies, he for the first time openly demonstrated from the human subject, offering to the scholars of Louvain an unaccustomed spectacle. He had himself in Paris only twice been present at a demonstration of the kind.

"During this sojourn at Louvain, it happened one day that Vesalius walked with his friend Gemma Frisius outside the gates. By accident their country ramble brought them to the Tyburn of Louvain, the spot on which it was usual not only to execute criminals, but also to expose their bodies. It was a place of human bones, and of men's corpses in all stages of corruption. To such a spot the friends came very naturally, led to it no doubt by a familiar path, for where else was there a retired nook to be found of which the scenery was more completely in accordance with the taste of an anatomist. Vesalius loved nature with the ardour of true genius, but his love was not at all for—

Russet lawns and fallows gray,
Where the nibbling flocks do stray;
Mountains, on whose barren breast
The labouring clouds do often rest;
Meadows trim, with daisies pied,
Shallow brooks, and rivers wide;

He was a man who could have boiled his kettle with more pleasure in the valley of Jehoshaphat than in the vale of Tempe. Why should he not? Is the thighbone that propped up a lord of the creation less to be honoured than a primrose stalk? Or is the cup that has contained the brain and wit of man to be regarded with less tender reverence than buttercups and pumpkins?

"Vesalius and Gemma Frisius, whose humour it was to admire nature in the mechanism of the human body, looked at the dead men with learned eyes. The botanist a-field looks out for specimens to

carry home, so the anatomist Vesalius looked greedily about him, for in such a place the obvious question was, could he make any little addition to his *hortus siccus* of odd joints and bones?

"Now there had been executed on that spot a noted robber, who, since he deserved more than ordinary hanging, had been chained to the top of a high stake, and roasted alive. He had been roasted by a slow fire made of straw, that was kept burning at some distance below his feet. In that way there had been a dish cooked for the fowls of heaven, which had been regarded by them as a special dainty. The sweet flesh of the delicately roasted thief they had preferred to every other; his bones, therefore, had been elaborately picked, and there was left suspended on the stake a skeleton dissected out and cleaned by many beaks with rare precision. The dazzling skeleton, complete and clean, was lifted up on high before the eyes of the anatomist, who had been striving hitherto to piece together such a thing out of the bones of many people, gathered as occasion offered. That was a flower to be plucked from its tall stem.

"Mounting upon the shoulders of his friend, and aided by him from below, young Andreas ascended the charred stake, and tore away whatever bones he found accessible, breaking the ligaments which tied the legs and arms to the main trunk. The trunk itself was bound by iron chains so firmly to the stake, that it was left there hanging. With stolen bones under their clothes, the two young men returned into Louvain.

"But in the evening Vesalius went out alone to take another walk, did not return in haste, and suffered the town gates to close against him. He had resolved to spend the night a-field under the stars; while honest men were sleeping in their beds he meant to share the vigil of the thieves. There was the trunk of the skeleton yet to be had. At midnight none would dare to brave the spectacle of fleshly horrors, to say nothing of such ghostly accidents as might befall them among corpses of the wicked, under rain, moon, stars, or flitting night-clouds. Certain, therefore, that no man would come to witness his offence, Vesalius at midnight again climbed the tree to gather its remaining blossom. By main force he deliberately wrested the whole set of bones out of the grasp of the great iron fetters, and then having removed his treasure to a secret spot, he buried it. In the morning he returned home empty-handed. At leisure then, and carefully, he smuggled through the gates, day after day bone after bone. But when the perfect skeleton was set up in his own house, he did not scruple to display it openly, and to demonstrate from it, giving out that it had been brought by him to Louvain from Paris. The act of plunder was, however, too bold to escape attention. Vesalius afterwards was banished from Louvain for this offence.

"In the next year, 1535, Andreas, having completed his twentieth year, served as a surgeon in the army of the Emperor, Charles V., during the Gallic war. He was then earning a salary, and finding subjects for dissection on the battle-field. Soon afterwards he went to Italy, making his head-quarters apparently at Venice, and displaying his zeal and ability as an anatomist by demonstrating publicly under the shadow of the most famous universities. Andreas Vesalius at once excited the attention of the learned men of Italy, as a remarkable youth of twenty-one or two, who could name, with

his eyes blindfolded, any, even the smallest, human bone put into his hand, who was versed deeply in comparative anatomy, and had more accurate and practical knowledge of the structure of the human frame than any greybeard of the time had dared to master. He was a youth who had turned all the ardour and passion of his age into the service of that one mysterious pursuit at which his neighbours shuddered and admired; a youth who was at the same time an able scholar, and who could declaim his knowledge in sound Latin from the lecture-table. The intensity of his zeal and his own habit of mastery won for him in Italy so prompt a recognition of his genius, that he was only twenty-two years old when he was offered (in 1537) a professorship at Padua, created for him. It was the first purely anatomical professorship, and in accepting it Vesalius became the first professor of anatomy who taught the science, and received a salary for so doing from the funds of any university.

"A good deal of morbid curiosity, a corrupt taste for witnessing dissections of the human body as a novel spectacle, no doubt increased the number of the new professor's hearers. He was doing a bold thing, his lectures were a striking innovation on the tameness of conventional routine, and his fame grew with proportionate rapidity. He continued to hold his professorship at Padua during seven years, but he was at the same time professor in two other universities. He was sought by the academies for the same reason that causes an attractive performer to be sought at the same time by rival managers. Wherever he appeared, the theatre would fill. When already appointed at Padua, he was graced with a professorship also at Bologna, in which town he put together and compared the skeletons of a man and of a monkey. Being thus doubly a professor, he accepted also the urgent invitation of Cosmo, Duke of Florence, who desired that he should take office as Professor of Anatomy at Pisa. Cosmo secured his man not only by offering a salary of six hundred crowns for a short course of demonstrations, but also by commanding that the authorities should furnish him with a free supply of bodies, whether from the cemetery or the scaffold. In each university the services of the professor were confined to a short course of demonstrations, so that his duties were complete when he had spent during the winter a few weeks at each of the three towns in succession. Then he returned to Venice.

"At Venice, Andreas Vesalius studied indefatigably, at the same time that he practised physic. He not only solicited the bodies of condemned criminals, but also begged of magistrates that they would sentence such men to the modes of death that he from time to time suggested, in order that he might obtain physiological knowledge from his post mortem inspections. He was not afraid also to beg that executions might be delayed when he was well supplied with subjects, so that there might be material for him to work upon at a more leisure time. Furthermore, he watched—and incited his pupils to watch—all the symptoms in men dying of a fatal malady, and it was usual with him and them to note where, after death, such men were buried. For their bodies night-visits were paid to the churchyard, either by Vesalius or by some of his disciples, and a diligent search was then made for the accurate determination of the cause of death. Many a corpse was in this way secretly conveyed by Andreas to his chamber, and concealed in his own bed.

"At Padua and Bologna, where there was no bold Cosmo to back the teacher, no public means were ventured upon for the supply of the new lecture-table. It was supplied without trouble to Vesalius by the enthusiasm of the students, who became resurrectionists on his behalf. Thus it happened that on one occasion his class was edified by the emotion of a portly Petrarch under a monk's hood, who had sought in the excitement of anatomy a refuge from his grief for the recent death of a too well-known Laura. He sat down thinking of his old acquaintance with a sigh,—

Mai non fu'in parte, ove si chiar vedessi
Quel, che veder vorrei, poi ch'io nol vidi,—

and started with a shout that betrayed all his secret when he saw her stretched out on the demonstrator's table. She had been disinterred by the students as a friendless person—one who in life had not regarded her own flesh as sacred, and whose body, therefore, might be lectured from without risk of exciting any active outcry against desecration of the dead. Vesalius, who hated monks as false pretenders and obstructors of sound knowledge, enjoyed greatly this dilemma.

"During the first three years of office as professor, Andreas did not depart or wish to depart from the approved rule of study. He praised the works of Galen in good faith, and made use of the anatomical writings of that ancient author as the text-book upon which he founded all his demonstrations. With practical experience, however, the conviction grew, not only that the anatomy of Galen was extremely incomplete, but that it was often wrong. He had marked down upon the margins of his text-book as he detected them many discrepancies between the text of Galen and the human body. These variations he found, as he went on, were constant. Then, dissecting lower animals, and monkeys more especially, he made comparison between their parts and corresponding parts in man, until he became convinced that Galen very rarely wrote from actual inspection of the human subject, that he had been a great anatomist, but that his teaching was based on a belief that the structure of a monkey was a direct copy of the structure of a man. Galen had not ventured often to run counter to the tide of superstition, and defile himself by too close contact with the dead of his own race. This fact being ascertained with certainty, Vesalius took more than usual pains to note every discrepancy between the text of Galen and the actual parts which it endeavoured to describe. The list of these variations—annotations upon Galen—formed in a short time a volume of considerable thickness.

Having thus seen reason to distrust the foundations upon which the whole structure of medical science was, in his time, built, Vesalius, at the age of twenty-five, resolved to reconstruct more durably the science of anatomy. He perceived only one way in which this could be done: he would dissect minutely through the human body, and write down all that he found there carefully and accurately in a well-digested book. He would collate upon each point the evidence obtained under the scalpel with the writings of the authorities who occupied the schools before him, would retain their nomenclature, and repeat their truths, but rectify their almost countless errors. To this bold enterprise, after his genius had once admitted the idea, Vesalius was further impelled by the

encouragement of his friends, and chiefly by the incitements of a colleague in the University of Padua, Mark Antony Genua, and of the patrician, Wolfgang Herwort. So it happened that, at the age of twenty-five, Andreas Vesalius, already a famous teacher, began to write, from actual scrutiny, his text-book of *The Fabric of the Human Body*. He at the same time practised medicine, and expressed loudly and often his regret that the art of healing and the science of anatomy were followed as two separate pursuits. He declared a correct knowledge of anatomy to be essential both to the physician and the surgeon, and he taught the science in his writings with a constant reference to medicine and surgery, bitterly ridiculing those practitioners who got their knowledge of disease out of a study of syrups.

"It is possible to tell in a few paragraphs all that is known to have been done before the time of Vesalius for the promotion of the study of true human anatomy. In very ancient times it is proved that there was no lack of dissectors, those of the Alexandrine school used the knife freely on the human subject. Herophilus is said to have cut up and examined three hundred bodies, without reckoning his vivisections. Of the anatomy of the ancients, however, nothing has been transmitted except what has come down to us in the extant works of Galen. Galen, it has been shown, dissected lower animals and monkeys—rarely man. When contact with a corpse made expirations and ablutions necessary, it was not an easy thing to be an accurate anatomist. After the death of Galen that chief still continued to hold sway for centuries over the world of medicine. The Arabians put implicit faith in him, and copied all his errors, adding many of their own.

"In the middle ages practical anatomy, when it attempted any inspection of 'the Divine image,' was regarded as impiety; nevertheless, a first step in a right direction was made by Mundinus, about the year 1315. Mundinus, professor of medicine at Bologna, between the years 1315-18, exhibited the public dissection of three bodies, and by so doing was the cause of a great scandal. Alarmed by an edict of Pope Boniface VII., he gave up his dangerous experiment, but he had published a work, *De Anatome*, containing much original matter, which was adopted by the learned world, and prescribed to be read in all academies.

"For three centuries this work continued to be in force as an authority. In the time of Vesalius, Mundinus was read commonly as a supplement to the anatomy contained in Galen, and if any anatomist had new facts to record he edited Mundinus, and attached to the text of that author his own experience in the form of commentary. In the year 1520, Mundinus had in that way been supplied with notes by Alessandro Achillino, and edited by his brother Philothes at Bologna, and in 1521 the book of Mundinus was again amply illustrated by Joannes Carpus Berengarius, the best of the precursors of Vesalius. Mundinus wrote succinctly, treating of parts in their natural order, but his information was not only succinct but also meagre; his style being obscure and barbarous, often incomprehensible, his errors many. His errors were so many that Matthew Curtius—who spoke before Vesalius had shaken the old paramount authority—said of Mundinus, 'all that is right in him is Galen's, but his own matter is always wrong.' Achillino was pronounced jejune, Berengarius diffuse, but really

good. Carpus Berengarius introduced also into his edition, for the first time, pictures, by which the eye was enabled to comprehend the details given in the letterpress. The pictures were rude, nineteen in number, increased in another publication, two years afterwards, to twenty-two. These plates deserve to be remembered by anatomists as the first efforts that were made to facilitate their studies by depicting as well as describing the construction of the human frame. In 1534, Albert Durer depicted the symmetry of the body in four books, but rather as an artist than as an anatomist. The greatest painters, protected by Julius II. and Leo X., had been allowed to study practically just so much anatomy as was required for the perfection of their art. Drawings from nature of the superficial muscles had been made by Leonardo da Vinci, Raffaele, and Michael Angelo. Representations of the anatomy of deep-seated parts immediately preceding the publication of the plates issued by Vesalius, were edited in 1540 by Walter Hermann Ryff; and a more valuable set, in which the brain is well depicted, and its parts figured and named, was published by Balthasar Pistor. None of these works were at all calculated to disturb the supremacy of Galen, or to create any revolution in anatomy. But they were indications of the ripeness of the field for work like that to which Vesalius devoted himself with the whole fresh zeal of youth, and all the vigour of his genius.

"The income derived by Andreas from three professorships, and from his practice among the Venetians, perhaps also the prosperous wordly condition of his family, enabled him to expend money freely in the prosecution of his literary work. He took pains to secure, not only for his descriptions of parts, but also for the representations of them to be published in his book, the utmost possible fidelity and beauty. It cost him not a little to tempt able artists from their studies of the beautiful to sit and paint, day after day, from a dissected corpse. Grudging no cost, he succeeded so well as to obtain for his book anatomical plates, not only incomparably better than any that had previously been published, but more excellent as works of art than very many that have appeared since his day. The chief artist engaged with him in this labour was Jean Calcar, native of Calcar, in the Duchy of Cleves. That artist studied during his best years in Italy, admiring chiefly the works of Raffaele and Titian. He was one of the most able of Titian's pupils, and so accurately seized his master's style and manner, that many works from the hand of Calcar, portraits especially, have been attributed to Titian. Rubens kept, until his death, a Nativity by Calcar, that was remarkable for its effects of light; and Calcar is well known to many in our own day as the painter of the portraits which accompany Vasari's lives; Calcar, then, was the chief artist engaged upon the anatomical figures published by Vesalius, and this circumstance accounts for the fact that those figures were in their own time often attributed to Titian."

P. S.

ORIGINAL ARTICLES.

THE SYMPTOMS AND RATIONAL TREATMENT OF POCKET-HANDKERCHIEF DEAFNESS.

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Some few years ago in his researches both in hospitals and in private work on catarrhal conditions of the ear causing deafness, the writer's attention was first directed towards the symptom-complex of what we might properly call pocket-handkerchief deafness. It had seemed to him that too little attention had been paid to the etiological factors which bring on a progressive diminution in hearing. Otologists for years had been in the habit of treating catarrhal deafness on empirical lines. When a patient presented himself with diminished hearing, an attempt was made to relieve the condition by massage of the drum either with inflations with the Politzer bag, or with the Eustachian catheter. If the physician found it difficult to get air to enter into the ears, each time that the patient presented himself, more force was used to bring about the supposedly desired result, until in time some air was forced into the middle ear. Such treatment in many cases resulted in a condition which was far more serious than the original one; for where originally we had to deal with an obstructed tube, and a slight stiffening of the ossicular joints, we had now to deal with a relaxed ear-drum, which under ordinary circumstances could not be made to resume its proper tension.

The writer has very little doubt that most cases of progressive deafness occur in the same way, with the exception of those cases in which atrophic rhinitis is present in which the atrophy extends up in the Eustachian tubes, leaving the tubes widely open, and allowing too great a pressure whenever any extra force is used in blowing the nose, or in attempting to clear out the crusts and mucus in the nasopharynx. In this class of cases the use of the pocket-handkerchief will often cause an extreme grade of deafness which it is almost impossible to alleviate.

The patient who comes to us with hardness of hearing, as a rule has a progressive condition which has gone on for years without any

symptoms. A chronic inflammatory condition of the nose and throat is present, which has extended up into the Eustachian tubes, the result being that a stenosis has taken place. The inflammation has also interfered with the proper action of the tubal muscles, and very often adhesions have formed in the fossa of Rosenmueller, which further excites the trouble. The patient at first notices merely a stuffiness and fullness of the ears. At this time very little change has taken place in the middle ear itself, and very often inflation with proper treatment of the nose and throat will alleviate the condition, so that it is necessary to see the patient only a few times a year to prevent him from becoming deaf.

It is when the patient is at this stage that the most harm is done, either by himself or by a physician who treats him too strenuously. A patient often finds out that if he holds his nose tightly and blows hard he can force some air through the closed Eustachian tubes, and thus relieve the feeling of tension, but as time goes on he finds that he has to blow harder and harder, or often and more often until the inevitable result comes on, and the inflation of the ears in this way does no good. More often the patient uses his pocket-handkerchief to blow out the excess of secretions; therefore, we call this condition pocket-handkerchief deafness. If a patient goes to a physician he will often be told to try the Valsalva method of inflation—that is to close the nose, puff out the cheeks and swallow. To the writer's mind there is no more harmful practice than this, and one should caution all patients against its use. Or else the patient goes to some specialist, who thinks that the proper treatment consists in inflating the ear with compressed air using as much pressure as is necessary to get the desired result—in other words, to use pressure until the physician can hear the air through his sounding tube going into the middle ear. The writer has known physicians to use as much as 50 lb. pressure; under such circumstances he has had to keep on forcing it through a narrowed Eustachian tube, until the drum has become so relaxed that the patient has become totally deaf. Within a few years the writer has had three patients, who have become totally deaf by too forcible inflation of their ears.

The majority of otologists, the writer believes, are wont to consider that almost all cases of deafness are due to a catarrhal condition causing retraction of the drum, or a stiffening of the ossicular joints. Up to a few years ago, he had been under that impression himself, and had treated the majority of his cases by the usual methods. It was only after prolonged examination, and by the careful use of an electric otoscope, to which a massage apparatus could be attached, that he began to notice that in many cases of deafness the ear-drum, although retracted and thickened, was often at the same time relaxed. He made up his mind to study this

situation from every angle until he found to his surprise that at least 50 per cent. of the cases that came to the otologist suffered more from a relaxed ear-drum than from a retracted one. One does not have to be much of a physicist to realize that it is an impossibility for true sound waves to be conveyed through a drum which is diminished in tension. The writer reasoned (as he has found others have reasoned too) that a relaxed drum will cause a relaxation of the entire ossicular chain, and that in all probability the ligament of the oval window had lost its tension, and that the hearing of sound waves was interfered with. One peculiar symptom which struck him in many of the cases was that those patients had paracusis Willis—in other words, that they could often hear better in a noisy than in a quiet room. This had always seemed one of nature's paradoxes and until the present time had not been satisfactorily explained. The writer believes that this paracusis can be accounted for by the fact that ordinarily the ligament of the oval window is relaxed, but that when there is a great noise the increased tension exerted on the muscles of the middle ear, that is on the tensor tympani and the stapedius, results in a more proper tension being created within that small cavity.

When the writer first began to observe these manifestations the question arose as to what could be done to alleviate the condition, and it occurred to him that if some solution could be injected into the middle ear, which would excite an inflammatory reaction, we would be able to accomplish a two-fold result. In the first place, when the inflammation subsided there would be such a stretching of adhesions that the ossicles could more easily assume their former position, and in the second place, the resultant irritation to the drum would tend to draw it more tightly together. He first made these injections directly into the ear by inserting a ureteral catheter through the Eustachian catheter, and injecting various medicaments through this little tube. He first tried fibrolysin in the hope that the direct application of this medicine would have a tendency to dissolve the adhesions. Finding that this was not so, and that any antiseptic solution would do as well, he injected a small amount of 10 per cent. argyrol in this manner. In order to ascertain the amount of solution he injected, he applied the sounding tube to his own ear, and measured the amount injected by observing the sound when the solution first went in, and keeping on with the injecting until the patient felt a sensation of pressure. About $\frac{1}{2}$ c. cm. was usually sufficient.

Certain definite symptoms were observed after this treatment. Many patients would become dizzy and sometimes nauseated, due to interference with the labyrinth by pressure on the oval and round windows. Within the course of a few hours a severe inflammatory reaction would set in, which often laid the patient up in bed for

one or two days with fever and pain. A transudation of serum would take place through the drum. Much to the writer's surprise, within the course of a few days, the discharge would stop, and the patient's hearing would be remarkably improved. However, the improvement was temporary, and he felt himself at a loss to proceed further.

The writer was extremely fortunate a few months later to receive a pamphlet from Mr. Heath, of London. Apparently he had been confronted with similar cases, and he, to the writer's mind, has now solved the problem in the right way. His paper is a masterpiece which gives a clear and definite idea of how to treat this condition in a more or less simple manner. Since then the writer has employed Heath's treatment with other procedures, which he considers of great value, and which he will now outline.

As stated, the principal thing to do is to bring back the drum to its proper tension and to tighten the ligaments between the ossicles by creating an inflammatory reaction, which when it subsides will not have created any particular harm, but at the same time will have created a certain amount of connective-tissue infiltration. That no harm is done in attempting a procedure of this sort is mainly attested to by the fact that nearly all the patients that the writer has treated in this way have had no impairment of the hearing mechanism and have improved beyond any hope that he may have anticipated.

The success of Heath's treatment, and the one that the writer employs, is due to the daily applications of irritating fluids to the ear-drum, so that the drum remains inflamed over an extended period of time. It is easy enough to see what will take place as the drum becomes more and more irritated and inflamed. A thickening takes place, which thickening draws on both the circular and straight muscle fibres of the drum; and instead of retraction, the membrane is drawn out until it assumes a more normal position. This tightening is always more noticeable around the circumference of the drum and its attachment to the annular ligament. The joints between the small bones of the middle ear having been more or less ankylosed, as the drum is drawn out there is a tendency for these joints to loosen up. This lengthens the ossicular chain, with the result that more tension is put upon the ligament of the oval-window. Let it be said here that the result we desire in these cases cannot be accomplished in a short time. Often it is necessary to have the patient come in to you daily over a period of six or eight weeks, and this treatment must be repeated at the end of two or three months; and often it has to be repeated again and again during a period of one and a half to two years. One is agreeably surprised at times to find a marked improvement at the end of a month both in the amount of hearing and the relief of the tinnitus.

It is particularly important in cases of deafness to differentiate between those cases with a retracted drum and a stenosed tube, and those cases with a relaxed drum and a stenosed tube. The writer leaves out of consideration here the relaxed drum with the open tube, which is an extremely difficult condition to treat.

In order to make the proper diagnosis in these cases the writer first makes a thorough examination of the nose and nasopharynx. Of course all nasal obstructions should be corrected. In many cases adhesions are seen in the fossa of Rosenmueller, either with the pharyngoscope, which the writer devised some years ago, or with the Holmes nasopharyngoscope. If adhesions are found, these are readily broken down with the finger. The next important step is to determine the patency of the Eustachian tubes. The writer first attempts to inflate the ear with the Politzer bag. If no air goes into the ear he next tries gentle inflation with the Eustachian catheter. In a large proportion of cases air enters the middle ear not at all, or with some difficulty. In these cases it is not sufficient simply to tighten up the drum, but proper treatment should be given to the tube and middle ear by means of suitable bougies. The next step is to determine the tension of the ear-drum. This is best done by observing the drum through an electric otoscope, which can be attached to an electric or hand massage apparatus. During the massage one watches the excursions of the ear-drum the whole time. It may be entirely relaxed or just certain portions of it, the other parts being bound down by minute adhesions in the middle ear cavity. As a rule these patients have a positive Rinne test and paracusis Willis, and many of them complain of an annoying tinnitus. The hearing with the watch is often negative. Heath, in his treatment of these conditions, depends entirely upon the application of an irritating medicament to the drum. But often the tube is closed. This shows the important part that the Eustachian tube plays in these conditions, and the necessity for its treatment at the same time. He makes use of a preparation of cantharides. The strongest solution is cantharides collodion. The weaker solutions are made up in exact proportions as follow: To one ounce of water is added 1 gr. cantharides, and 1 gr. potassium hydroxide; this is called solution number one. One-half of this solution is poured into an ounce bottle and made up to the full ounce with glycerine; this is solution number two. A similar dilution is made from this for solution number three, and the fourth solution is made in the same manner. We thus have five solutions which can be used as indicated.

A daily application is made to the ear-drum extending over a period of four to six weeks depending upon the amount of reaction that takes place. One starts in with the strongest solution, that is the cantharides collodion, by applying it to the drum with a cotton

tipped applicator. The writer has found it advisable in all cases to wipe out the canal thoroughly before each treatment with a salve composed of 1 per cent. yellow oxide of mercury. If this is not done some of the collodion is likely to run down into the canal proper and create a blister, which is very painful and distressing. If a blister takes place it is only necessary to prick this with a fine needle or paracentesis knife, let out the fluid and dry the parts well. Before the second application takes place, the canal is wiped dry and all particles are cleaned off the drum, when the solution can be applied usually in its full strength; but if too much inflammation is present, one of the dilute solutions is used. The success of the treatment depends greatly upon one's using the proper judgment, and not exciting the drum too much. Thus one must continue, watching the drum day by day and varying the strength of the solution as indicated, until one finds a scaling of the superficial epithelium, and until serous discharge takes place. The writer usually continues the treatment until there is some discharge, and then watches the case, carefully wiping out the serum and debris day by day, being assured in this manner that no harm has been done.

As stated before, in most of these cases the writer is not content with applications to the ear-drum only. If there is a stenosis of the Eustachian tube, he applies a bougie every once in a while to keep the tube open. He may in some instances use the very gentlest of massage. He always cautions the patient to be very careful about blowing his nose, and under no circumstances to blow hard enough to get any air into the middle ear. If he has succeeded in keeping the tube open, enough air enters with the act of swallowing to give all the necessary massage.

The writer is always very careful to warn every patient that goes through this course of treatment, that during the time of treatment their hearing will be considerably impaired. Many of them become almost stone deaf, and during the first course of treatment are very much distressed, and are very sure that they are never going to hear again. One must be continually assuring them that such is not the case; for it is most evident that, while the inflammatory reaction is going on, very few sound waves can be transmitted through the middle ear. Patients are not so alarmed at the second course of treatment.

The report of Heath's cases made the writer enthusiastic, and he is very glad to say that after trying his treatment for some time he can corroborate most of his results.

Before reporting a few of his own cases, the writer will give you in detail one case of Heath's which impressed him the most.

"CASE III, Dr. P. This medical man, age forty-six, consulted me in the long vacation of 1908. While in practice and subsequently he had frequently

taken expert advice. One ear had been useless for twenty-eight years, and the other (while capable of use) had done double duty. The hearing in the latter ear gradually diminished until it failed completely five years ago. He then sold his practice. My notes make mention of the fact that for two years he had been at Oxford in order to take a degree with the intention thereby of following some other calling. He had all the symptoms I have described, and was so extremely deaf in both ears that I was compelled to communicate with him in writing. There was also marked nasal catarrh. I painted both drums on this occasion for two months with some slight benefit; it just enabled him to hear one shouting into his ear. In May of last year (1908) he returned and was treated for another month. In the long vacation he came to me again and was treated for two months more. At the end of that period his hearing had considerably improved and conversation was easy. The contraction which followed the later treatment resulted in the restoration of his hearing in both ears.

"Without consulting me in the matter he purchased another practice and had resumed medical work after an absence of five years. Though living some distance from London he has come here this evening for your inspection, and to listen to my remarks. In addition to the quality of his hearing, which you can test with watch and whisper, you will be able to observe the new fibrous tissue in his drum membrane whereby it has been strengthened. . . . The improvement in his hearing will doubtless be maintained, for during the two and a half years which have elapsed since I initiated this treatment no relapses have occurred. I have advised him, however, as I advise all patients with this kind of deafness, to desist from the practice of holding the nose tightly when blowing."

To this case the writer would like to add three of his own.

CASE I.—Mrs. K, *æt.* thirty, suddenly lost her hearing at ten years of age. When her adenoids were removed her hearing was considerably improved. For the past ten years her hearing has gradually diminished, although up to two years ago she had had treatment with inflation. Her hearing has gradually grown worse in the left ear. Both ear-drums show relaxation. She hears the watch at 2 in. in the left ear and 3 in. in the right ear. Has no paracusis.

The writer began treatment with her on March 7th, 1913, making applications to both drums over a period of six weeks, at the same time opening up the Eustachian tubes. Within ten days the tinnitus had disappeared from both ears, and has never returned. She had a profuse discharge from the right ear, which continued for two or three months. The writer again saw her on October 9th of this year, at which time she had no tinnitus, and heard a watch at 10 in. in both ears. She has had only one course of treatment with apparently good results. But the writer thinks this is hardly enough for a permanent cure.

CASE II.—O. L., *æt.* twenty-nine, consulted the writer first on April 13th, 1912. He found a complete closure of both Eustachian tubes. Her hearing has gradually diminished during the past five or six years. She had a paracusis Willis, and could not hear the watch up to either ear. There was no improvement after dilating the Eustachian tubes, and at the end of six months the writer started with applications to the ear-drum. She has gone through three periods of treatment, and the writer is happy to say that at this time her hearing is considerably improved, and the tinnitus has stopped. She has no difficulty at present with her work as a stenographer, although when she first came to him it was impossible for her to hear what was being dictated to her.

CASE III.—Mrs. M. *æt.* thirty, consulted the writer about six weeks ago. There has been gradual diminution of hearing in the left ear for four years with tinnitus. For the past four months there has been a thick feeling in the right ear. The writer began applications to the left ear-drum, which were continued until two weeks ago, and kept the right Eustachian tube open without making any applications to the drum. Much to his surprise, at the end of this time her hearing was considerably improved, until she can now hear a watch to the left ear at a distance of 4 in. and in the right at 20 in. Both ear-drums look stronger and are considerably tighter than before treatment.

Of course, it is too early to say definitely what the final results in these cases may be, and the writer has many cases under treatment at present, from which he does not expect to hear any encouraging news for some time to come. Up to the present time he has treated 14 cases in this manner. One evident fact strikes the writer—that in no case has any harm been done, and that all patients seem to feel better after the treatment is over than they did before they came to him, and are perfectly willing to return. Heath's cases which he has had an opportunity to observe for some years are so encouraging that the writer feels the utmost confidence in continuing. The treatment is rational and, when used by competent men, certainly deserves every encouragement.

The writer has written on this subject at some length because he considers it necessary for us to differentiate more carefully between the various forms of deafness. It is not sufficient for a man to continue treatment on cases day after day, week after week, or month after month in the same old way, and at the end of a year say that the patient has improved simply because his tuning forks show a microscopic improvement. We should be after greater results than these, and we should not be satisfied until the patient himself appreciates that his hearing has improved. We should all condemn most heartily the Valsalva method of inflating the ear, and should warn our patients against the danger of using a pocket-handkerchief in an improper manner. The result of the writer's experience in the treatment of these cases and in the differentiation of the different forms of deafness, leads him to believe that we are at last getting to the stage where it is possible for us definitely to state to the patient just what we can do to alleviate his condition.

11 West Eighty-First Street.

CLINICAL APPLICATION OF ABDERHALDEN'S REACTION
TO ENLARGEMENTS OF THE THYROID.
(AUTHOR'S TECHNIQUE.)

By CLARENCE F. BALL, M. D., of Rutland, Vt.,
Pathologist, Rutland Hospital.

The energetic German, Prof. Emil Abderhalden, to whom the profession owes so much, has recently supplemented his serodiagnostic test with a comprehensive and elaborate study relative to the actual amino-acid content of normal blood. He used previously unthought of quantities of blood, 50-100 litres, to determine, as far as possible, the normal amount of amino-acids. He states in his findings that in these large quantities he was able to obtain but 0.4 grm. in any single instance.¹ The following amino-acids in pure substance were obtained and identified: prolin, leucin, valin, alanin, glyocol, aspartic acid, glutaminic acid, arginin, lysin, and histidin. Normally this amount of amino-acids does not pass through a properly selected dialyzing thimble in sufficient quantities to give the ninhydrin reaction, as may readily be demonstrated by placing the clear serum in such a thimble and incubating it from fourteen to sixteen hours, when 5 c.cm. of the dialysate will remain clear upon boiling one minute with even 0.2 c.cm. of a 1 per cent. solution of ninhydrin.

In a diseased condition the hyper-amino-acidemia, a term recently suggested by Abderhalden, is due to the digestive action of the protective ferment digesting the invading cell or organism. The protective ferment is produced by the group of cells being invaded, and is produced with a special digestive action upon the particular enemy making the invasion. Vaughn² states: "Ferments are specific in two senses: First, each kind of cell elaborates its own ferments, and secondly, the ferment is able to split up only certain proteins."

When the serum of blood containing a protective ferment is incubated in the dialyzing thimble with a proteid similar to the invading process, it will reduce that proteid tissue to its elemental form of amino-acids, as demonstrated by the dialysate giving a distinct color reaction when it is boiled with ninhydrin. The clear serum alone in the thimble, however, contains insufficient amino-acids to give a reaction when similarly treated.

Application of the test to enlargements of the thyroid tends to demonstrate that a ferment is produced that is specific to the con-

dition causing the increase in size. Any disease of the gland will call for the production of a ferment that will digest normal thyroid tissue in the dialyzing thimble; but only in a true malignant condition of the gland will a ferment be produced that will in the same manner digest a cancer proteid. This specific ferment action, referable to the thyroid, is similar to, and illustrative of the production of ferments for any other group of cells. It must be remembered that cells invaded either by a cancerous or sarcomatous growth produce a ferment that reacts interchangeably. This is true not only with the Abderhalden test, but holds good with other serum reactions.

In a previous article,³ the writer reported the case of a middle-aged woman with enlarged glands of the neck, right side, that would be considered probably tuberculous, except for the presence of a small hard bunch located on the under side of the bridge of the thyroid gland. The presence of this bunch suggested the possibility of the true condition being that of malignant new growth. The duration of the growth, so far as the patient was aware, was a little over three months. The ninhydrin reaction readily demonstrated the presence of a ferment capable of producing a hyper-amino-acidemia of the blood, and the correctness of the reaction was later verified by microscopic section as previously cited.

On January 7th, the writer examined three blood serums: two from patients with enlarged thyroids, one of which was a post-operative, and the other an early exophthalmic enlargement; the third case was blood from a woman sixty-five years old with a clinically malignant stomach. This serum, through the courtesy of Dr. Bellerose, was obtained for the purpose of running a known condition with the two unknowns, as a control. The clinical histories of the two thyroid patients will be briefly described. The younger of the two patients, a woman of twenty, had a moderate and uniform enlargement of both lobes, with a pronounced tachycardia, extreme nervousness, and considerable prostration at times. Mrs. M., a patient of Dr. L. A. Heidel, thirty-five years of age, had had but little trouble with her neck up to within a couple of months before her first operation, October 13th, 1913. A differential blood study made prior to the operation revealed the following: Blood-pressure, 138 mm. Hg., hemoglobin, 90 per cent., red cells, 4,300,000, white cells, 11,200, polynuclear neutrophils, 53 per cent., small lymphocytes, 39 per cent., large lymphocytes, 2 per cent., eosinophils, 5 per cent., and basophils, 1 per cent. These findings did not seem to contraindicate operation; accordingly she went to the operating-room a strong, robust woman, 'the picture of health,' except for the enlarged left-sided 'simple goitre.' Postoperative recovery was uninterrupted and satisfactory in every detail except that after the first week there seemed to be a slight induration of the tissues at

the bottom and a little to the right of the U-shaped incision. Local treatments seemed unavailing in reducing the thickened area; instead, a cluster of irregular tumors soon manifested themselves, giving a very suspicious appearance to the enlargement. This enlargement continued until eleven weeks after the first operation, when a serum study was made with positive findings, and a negative malignancy finding with the blood of the writer's patient, Mrs. H., the control being positive with the blood from Mrs. B., suffering with a cancer of the stomach.

Mrs. H. made an uneventful, nonoperative recovery. Mrs. M. went to the operating-room a few days following her blood study for reoperation, January 21st, 1914. While the patient was on the operating table, a frozen section was made for the purpose of ascertaining the exact nature of the growth, which proved to be a round-celled sarcoma. During the time taken to run the frozen section, the surgeon had found it impossible to remove the growth, as it had involved the large blood-vessels and pushed in posteriorly to the trachea; accordingly the wound was closed at once. The beginning dyspnea prior to the second operation rapidly increased, and the woman died a few days later from strangulation, February 4th, 1914.

These 2 cases demonstrate the value and the apparent necessity of running a serum study, even though experimental, on goitre patients. The serum of Mrs. M. would have given a similar result if it had been run prior to the first operation. Many an unpleasant experience like the above could thus be avoided. It is to be regretted that the ferment elaborated by the system is the same, serologically studied, for carcinoma as for sarcoma invasions. The patient, previously reported as having carcinoma of the thyroid, is well and free from any apparent recurrence following her operation last September. There were, however, the characteristic clinical differences in these two cases between the cancer and sarcoma manifestations that would have aided in their differentiation had the sarcoma in Mrs. M. shown itself prior to the first operation.

The writer is indebted to Schwarz⁴ for the details of his early technique. In all of the writer's seventy odd examinations, he has always used the half, or 5 c.cm. of dialysate, with 0.2 c.cm. ninhydrin at first, and later but 0.1 c.cm. His first twenty odd examinations were run using urinometer jars and large test tubes as improvised dialyzing chambers, with the thimbles suspended, as per Schwarz's directions, by silk threads. At first the blood was obtained by venipuncture as best chance might afford, using a long, aspirating needle, drawing the blood into a sterile test tube. Later the writer used the Losee⁵ collecting outfit. Apparent necessity for improvements in this technique soon suggested that some form of apparatus should be devised that precluded two possibilities: that

of bacterial contamination, and the soiling of the outer wall of the dialyzing thimbles either with serum or proteid materials when filling the thimbles. To meet these requirements, the 'fool proof' outfit illustrated and described in a recent article⁶ was devised.

The writer's technique with this special form of dialyzing apparatus, made by Eimer and Amend, of New York, is as follows, with the accompanying list of supplies at hand:—

Three-inch roller bandage for cording the arm above elbow.

Alcohol, iodine, and sponges for disinfecting the arm for venipuncture of median basilic vein.

Modified Losee blood-collecting outfit, preferably with $\frac{1}{4}$ in. 20 gauge needle.

Four or more improved dialyzing chambers.

Four or more *tested* Schleicher and Schuell 579A dialyzing thimbles.

Distilled water, preferably still for making same as required.

Sterilizers, steam and hot air, one of each.

Incubator, preferably electric.

Electric centrifuge.

Centrifuge tubes.

Graduate, 120 c.cm. or more capacity.

Four or more 5 c.cm. pipettes.

Test tubes, calibrated 18 mm. by 150 mm., generous supply.

Water bath and thermometer.

Ehlermeyer flasks, $\frac{1}{2}$ dozen, 120 c.cm. capacity, for boiling proteid tissues.

Forceps, several pairs, smooth bite for handling tissues.

Four glass pestles and mortars for macerating proteid tissues.

Curved medicine droppers, $\frac{1}{2}$ dozen, preferably graduated to $1\frac{1}{2}$ c.cm. capacity.

Ninhydrin, 1 per cent. solution.

Some form of cancer proteid, especially prepared; and some other form of tissue, preferably placental tissue, specially prepared.

Quantity chloroform.

Quantity toluol.

Bunsen burner for heating test tubes, or better, electric test tube heaters as designed by the author (Fig. 1). Units are manufactured by the General Electric Company, Pittsfield, Mass.

Blood should be collected before breakfast, and the serum allowed to separate while executing the following technique.

All glassware, except special dialyzing chambers, are carefully washed and sterilized by dry heat. The dialyzing outfits are prepared by putting 20 c.cm. of distilled water into them, and then placing a carefully tested dialyzing thimble upon the inner end of the funnel-formed stopper in such a position that it dips into the distilled water to a level a little higher than the expected contents of the thimble. The mouth of the funnel-formed stopper is then plugged with cotton as is also the mouth of the side tube. Before placing the thimbles on the funnel-formed stopper the hands should be carefully washed and disinfected, and even then the thimbles should be handled as little as possible and should never be placed in the containing chamber without washing the outside with distilled water. Arranged thus, the apparatus is ready for steam

sterilization. They should be steamed from 3-5 minutes only. It is an opportune time to reboil proteid materials while sterilizing the necessary supplies for the test. All proteids to be used must be reboiled just before using and should test negative with 1 c.cm. of a 1 per cent. solution of ninhydrin to 5 c.cm. of the water in which they were last boiled. In boiling the tissues, use ten times, by volume, distilled water as material to be boiled, and rinse the tissue with distilled water between each boiling.

The water bath should be started, at the same time that the dialyzing apparatus is being sterilized, for the purpose of inactivating

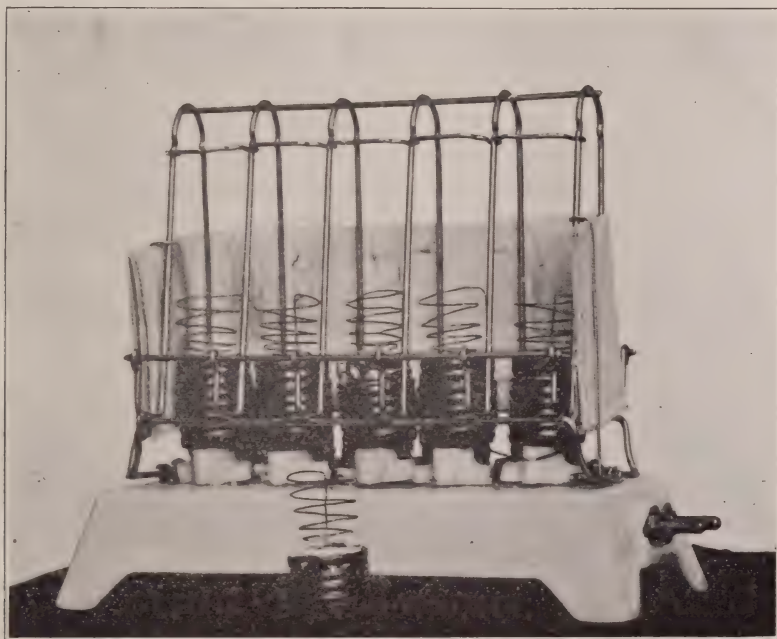


Fig. 1.—Showing five electrical heater units in series, as arranged by the author upon an electric toaster base, with a single unit showing in front.

1½ c.cm. of clear serum recently centrifuged. The water bath should be maintained at 56° C. for one hour to inactivate the serum effectually. Use in one of the dialyzing thimbles a like amount of the same proteid used with untreated serum in another thimble. As soon as the dialyzing outfits are sterilized and cooled, drop through the side tube one or two drops of chloroform and then add sufficient toluol to cover the *sterile distilled water* surrounding the *sterile dialyzing thimble*. Place a label on the apparatus for future notations.

Experience only can determine just what combinations of proteid materials may be best suited to the particular serum study under way. Sufficient blood must have been drawn in the morning about 8:30 to yield at least 6 c.cm. of clear serum, and only clear straw-

colored serum should ever be used. The patient should present himself for blood collection without having had any breakfast. In order to collect sufficient blood to furnish 6 c.cm. of serum, it was found necessary to supplement the centrifuge tube used by Losee with a heavy glass test tube. The writer makes a practice of collecting 20 or more c.cm. whenever possible, which furnishes 6 or more c.cm. of a clear serum. The serum that separates in the large collecting tube should be pipetted off instead of being poured into a sterile centrifuge tube. It is necessary to use an electric centrifuge in order to obtain the clearest serum, as the number of revolutions per minute are many more than can readily be obtained either by the hand or water centrifuge. With clear serum and properly prepared proteid material, as designated for the particular test, all is in readiness for filling the thimbles.

The writer invariably used two separate kinds of proteid materials and often three or more. He sets them up with each thimble holding 1 gm. proteid in $1\frac{1}{2}$ c.cm. serum, that is, thimble No. 1 would contain $1\frac{1}{2}$ c.cm. of inactivated serum and 1 gm. cancer proteid. Thimble No. 2 would have the same combination except that the serum had not been heated. Thimble No. 3 would either be a duplicate of Thimble No. 2, or have some form of a proteid entirely different from cancer, such as a piece of placental or muscle tissue. The same choice would be exercised in filling thimbles Nos. 4, 5 and 6, when used. Frequently the writer has run one of the thimbles with the serum alone, which he believes to be good practice even though one thimble in the set may contain inactivated serum and the proteid together. He has always used cancer and placental tissues together in almost all his cases for the purpose of having at least one uniform control. No matter, which way you are running the test, either for a malignant or pregnant condition, you have one side of the test of which you are pretty certain as to the probable reaction to be obtained, providing all runs well; if not, it then becomes an important factor in pointing out the error. After filling the thimbles, 10 drops of toluol are added and the outfit is ready for the incubator.

It should remain in the incubator kept at 37° C. for from fourteen to sixteen hours. Shortly after removal the dialysate should be tested with ninhydrin. Remove funnel-formed stopper with attached thimble, insert pipette with the finger over the top to prevent the entrance of toluol into the tip of the pipette when lowering it into the dialysate; the end of the pipette should be held half way down, so that suction in filling it will draw from the center of the solution rather than from the bottom. Five c.cm. are thus measured and then emptied into one of four or more sterile test tubes uniformly calibrated, to which 0.1 c.cm. ninhydrin is to be added. The tube is heated at the same level in the same flame used for its fellows

for just one minute and then allowed to cool. As it is readily observed by those using a gas flame that one tube boils differently than its fellow, it is evident that a device delivering a predetermined, constant heat value would be advantageous. The heating unit previously mentioned meets such a requirement. Each unit contains the same lengths of No. 0.30" calorite wire, consequently the caloric heat value of each must be the same. Five or six of these units have to be put in series, otherwise they would melt down at once if the full current was passed into a single unit.

Washed, chipped glass should be placed in the bottom of each test tube to prevent the boiling over of the contents. Each test tube thus prepared containing an excess of amino-acids turns a clear blue-violet color. The tube showing no coloration of the dialysate indicates that there was no reducing process that took place in the thimble. The tubes must be allowed to stand for a half hour after boiling, before making an interpretation. If the test has gone on satisfactorily there will be no need ordinarily of making a diagnosis based upon differences in shades. There are times, however, with the best of technique, that one has to fall back upon reading shade variations. In such instances, one should, whenever possible, make a retest to confirm or negative the first interpretation.

The preparation of the proteid has not been considered, or the testing of the thimbles, because that part of the test is the same as has so often been described by different writers. The selection of desirable cancer material is sufficient material for a paper by itself, and will be so treated by an article in preparation.

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REPORT OF A CASE WITH AN OPEN SAFETY-PIN IN
THE ESOPHAGUS.

By GEORGE W. MACKENZIE, M. D., of Philadelphia.

The patient, G. A., *æ*t. seven months, referred by Drs. J. P. Craig and George C. Webster, of Chester, Pa., October 8th, 1913.

History.—On the evening of October 7th, while preparing her infant for bed, the mother noticed him playing with an open safety-pin. A short time after, the mother missed the pin and began a search for it. Not finding it and fearing the child had swallowed it, the parents summoned the family physician, Dr. Craig. Examination by him failed to locate the pin either in the mouth or pharynx; furthermore, he was unable to detect any laceration of the oral or pharyngeal mucous membrane. Since the child appeared to be comfortable and nursed the breast without embarrassment, it was decided by the family and the physician to wait until morning. During the night, the child rested about as usual.

Early in the morning, October 8th, the child was transferred to the Crozier Hospital, Chester, where Dr. George C. Webster skiagraphed the patient's chest, which revealed an open safety-pin in the esophagus just below the level of the first rib and with its point directed upward (Fig. 1). The child was then referred to the writer on the afternoon of the same day.

Before attempting the removal of the pin, several things had to be considered, including a careful study of the radiograph, the age of the child, the various instruments obtainable for the closure and removal of safety-pins, and the nature of the anesthesia to be used.

Because of the rarity of the condition, the writer invited Drs. G. J. Alexander and Charles O'Reilly to be present, since both had had considerable experience in this special line of work.

A Lerche safety-pin extractor was secured from the Harvey R. Pierce Company. Preliminary experiments with this instrument and an open safety-pin placed on the table, and, too, with the pin in an improvised tube failed to convince us of the practical working of the instrument, as much as the design appealed to us theoretically. Furthermore, after repeated experiments we found one decided objection to the instrument. For instance, in the event of engaging the pin and failing to clasp it successfully on the first attempt, it was next to impossible to disengage the instrument from

the pin; consequently, any attempt at removal of either would necessarily be followed by severe laceration of the esophagus. Such a risk alone is sufficient, in the writer's judgment, to condemn the instrument. Another contingency which prevented the writer using the Lerche extractor, had he cared to do so, was its size. It could not be passed through a 6 mm. tube—the size adapted to a child of seven months.

Even had we been able to pass the instrument down the tube, the amount of light would have been so much reduced as to place us in the position of working, practically, in the dark.



Fig. 1.—Child's bony structures and the pin, actual size. The pin is shown double because it moved with respiration during the skiagraphic exposure. This is a positive and hence reversal of the negative.

One feature of this instrument, however, appealed to the writer, and that was the worm-like probe for hooking the ring of the pin. It occurred to him that with the probe, minus the rest of the instrument, the ring might be hooked and pushed into the stomach far enough to invert the pin and draw it out (point downward). This was tried experimentally in an improvised tube, with but partial success. There was a tendency for the pin to slip off the hook probe—a risk too great to take; for a subsequent gastrotomy in a child so young is attended with considerable danger.

The Mosher instrument, as illustrated in Wendell Phillips' book, p. 810, appealed to the writer, from the illustration, to be the very instrument needed; but it could not be obtained from any of the instrument makers in Philadelphia.

The only available instrument left was a double tenaculum forceps with very short (1 mm.) teeth; an instrument sold by Reiner, of Vienna, with the Kahler set.

Experiments with this instrument and an open safety-pin on a felt-covered table proved to our satisfaction the possibility of closing the safety-pin, the majority of times it was attempted; while our failures were not total failures, for we could, at least, bring the point and the clasp sufficiently close together as to leave the slightest amount of the point exposed, and this was shielded by the instrument. We found that the double tenaculum forceps worked much like the loop of the Lerche instrument, but with much more satisfaction.

The tenaculum forceps had one great advantage over the hook and snare instrument, in that, in the event of failure to clasp the pin, it could, at least, be readily disengaged.

A bad feature of the tenaculum forceps that the writer was slow to recognize was the needle-like sharpness of its points. Should he be tempted to try the instrument again, in a similar case, he would see to it that the points were made quite dull.

Ether was selected as the safest anesthetic and was administered by Dr. Craig. A 6 mm. Kahler tube was passed with ease and with no embarrassment to respiration. With the best light obtainable, the pin could not be seen. The entire esophagus was inspected as best it could be, but without success, nor could any metallic clicking of the tube with the pin be recognized. We were annoyed less with secretion and vomitus than had been expected. The forceps was introduced through the tube and an attempt made to feel for the pin. It was not long before something was grasped with an apparent click. The forceps was closed firmly with the object of claspings the pin. On attempting to withdraw what was within the grasp of the instrument, there was a tugging, a resistance. The writer succeeded in bringing it to the muzzle of the tube, when it let go. The question arose in his mind, Did he have the pin in the grasp of the forceps, or did he have the mucous membrane of the esophagus? At this writing he is inclined to believe that he had only the mucous membrane of the esophagus, and not the pin.

This manoeuvre, somewhat modified, was repeated six times, but with no more success or certainty of having had the pin than after the first trial. Early in our efforts there was some bleeding, but never profuse.

An 8 mm. tube was then attempted, but it was found to pass with

so great a resistance that persistent effort with it was abandoned. In fact, the writer is not quite sure that some harm did not result from its use.

Notwithstanding the six unsuccessful attempts at removal of the pin and the more or less laceration coincident with our efforts, and the administration of ether for half an hour, the child came out of the anesthetic in good shape and appeared to be no worse off from its experience. The pulse and respiration were relatively normal according to the report of the anesthetist.

Dr. J. W. Franck was called in to make a fluoroscopic examination of the chest. He believed that he saw the pin located in the same position as shown in the first radiograph, but of this there was some slight doubt. Unfortunately he did not inspect the region of the stomach, for his attention was directed to the upper chest.

The child was removed to its home for further clinical observation and skiagraphy.

The following morning, 9:00 a. m., Dr. Webster took the second photograph, which showed the pin to have entered the stomach (Fig. 2). A third photograph showed the point of the pin unchanged from that shown in Fig. 2. Clinically, the child was doing apparently well, according to the report of the family physician. At 1:00 p. m. the child went into rapid collapse and died in half an hour.

Clinical Report and Autopsy Findings, October 7th, 1913, by Drs. Craig and Geo. C. Webster, Jr.—All efforts to recover the pin by esophageal instrumentation on October 8th failed, and further attempts were to be made the following day after securing other x-ray photographs. The child was taken home apparently none the worse for the operation, and had no difficulty through the night, except some fretfulness, and, according to his mother, some difficulty in nursing. In the morning about 10:00 a. m., she reported at the hospital, and three x-ray pictures were taken. At this time it was noticed that the child was very pale, restless and having difficulty in breathing. These symptoms were quite pronounced between the time the second and third pictures were taken, but were not considered alarming. The child was taken home and died between 1:00 and 2:00 p. m.

A post-mortem was secured and performed the following morning. The thorax and abdomen were opened in the routine manner. When the left pleural cavity was opened there was found nearly a tumbler full of fluid resembling cream tomato soup. This was removed and the lung was found collapsed; attempts at formation of rosy, yellow-like adhesions over the collapsed lung and irregularly over the pleura were present. The right pleural cavity and lung were normal, as was also the heart. The pin was felt, freely movable, in the stomach.

The stomach from the pylorus, with the esophagus, and a portion of the trachea with the lungs attached were removed and taken to Dr. Mackenzie's office for examination, on the afternoon of October 9th, 1913. And after careful examination and inflation of the stomach and esophagus with water, a small perforation about a pinhead in size was discovered in the esophagus on the left side, just below the lower border of the left lung, and in communication with the left pleural cavity. (*Signed, Drs. Craig and Webster.*)

It did not occur to those making the autopsy to save the contents



Fig. 2.—Anteroposterior view. The photograph was made with the negative to the back and the tube in front of the patient. An intensifying screen was used, hence this positive shows the parts in their normal relationship. The pin is in the stomach. Exposures of Plates 2 and 3 were made within a few minutes of each other.

of the left pleural cavity for further study. When the specimen, wrapped in a towel, was brought to the writer's office, he managed to scrape a slight amount of secretion from the visceral pleura, and this was sent to the Philadelphia Clinical Laboratory for examination. The report was as follows: "Examination of smear on slides shows a mass of pus cells and short-chained streptococci. Fat droplets not found. Food products not found." The writer subsequently made stereoscopic photographs of the specimen, placing a tiny piece of chalk in the tear of the esophagus to show it to better advantage.

In reporting this case, the writer begs to acknowledge defeat, and trusts that others who may have a like case to handle will profit by his errors.

In looking over the literature, since this unfortunate experience, the writer found the nearest parallel cases to be those reported by Chevalier Jackson.¹ He reports the successful removal of safety-pins in 2 cases by the use of a special forceps (double tenaculum). He managed, under ocular guidance, to seize the pin by the ring, push it into the stomach, invert it, and draw it out with



Fig. 3.—Plate 3. Side view. Positive made from a negative, hence a reversal of the picture made from the left side of the patient and not the right side as appears in this positive. The pin is shown in the stomach. The pointed extremity appears short because it is presented more or less in end view.

the point directed downwards. He furthermore accomplished the feat in one case in seven minutes and without any apparent loss of blood. In his closing remarks Jackson says: "It is my custom not to use any anesthetic for foreign body cases in infants, especially esophageal foreign body cases, as in these there is much more likely to be dangerous dyspnea, partly from pressure stenosis of the trachea and partly from pressure on the vagi."

In the index medicus of *Oto-Laryngology*, published by the *Laryngoscope* and that by Joseph C. Beck, for the last three years,

the writer finds numerous cases reported of foreign bodies in the esophagus; many of these reports he looked up further. He was surprised to find how frequently the foreign body happened to be the whole or a fragment of dental plates. He was further impressed with how frequently it occurred that the foreign body had sojourned for weeks in the esophagus before it was finally removed. Such patients, for the time being, were compelled to take their nourishment in liquid form (Liebault,² Wurtz,³ St. Clair Thomson⁴).

The experience in this case has taught the writer some lessons:—

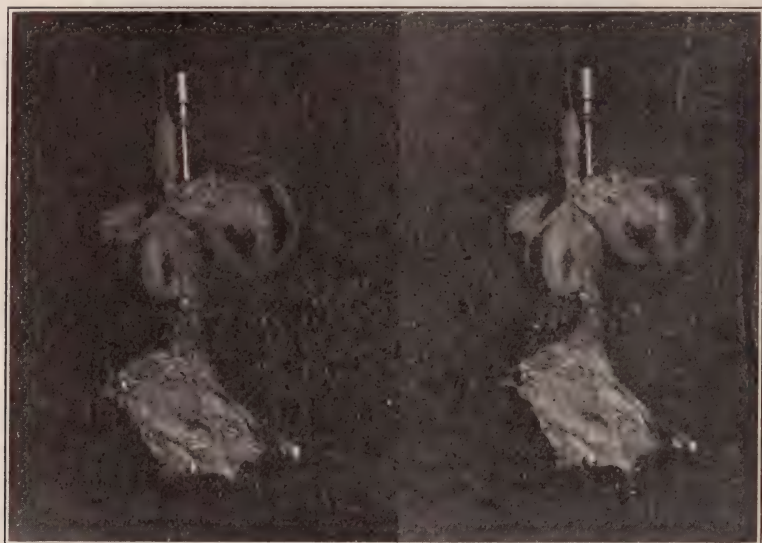


Fig. 4.—Stereoscopic picture of the trachea, esophagus, lungs and stomach viewed from behind. A small piece of chalk is inserted into the esophageal wound to show the wound to better advantage.

(1) That, in view of the experience of others in removing foreign bodies, weeks and even months after their lodgment in the esophagus, there need be no hurry in any case that does not present alarming symptoms, and then make haste without hurry.

(2) That, in the words of Jackson, "the esophagus is, surgically, the most intolerant organ in the body. It must be dealt with in a most careful, gentle way, always under the guidance of the eye." The writer wishes to emphasize this last admonition. If the esophagus is too small to accommodate both the tube and extractor and yet see the pin, it would be better to make use of the fluoroscope.

(3) That, in a child so young where it is quite impossible to grasp and close the pin, it is better to use some suitable forceps,

such as Jackson's, to engage the ring, push the pin into the stomach, invert it and bring it out with point directed downward.

(4) That, ether is quite a safe anesthetic to be used in children for esophageal operations, perhaps the more so if insufflated with the Elsberg apparatus.

(5) That, the position of the child lying flat on its back on a hard table with the head extended over the end is quite a satisfactory one for the passage of esophageal instruments.

(6) That, an 8mm. esophagoscope is too large in a child seven months old. The writer has the impression that the 8mm. tube was more responsible for the tear in the esophagus than the pin itself.

(7) That, with a sharp tenaculum forceps used in the esophagus, it is possible, especially when working by the sense of touch alone, to grasp the mucous membrane and be misled into believing that you have the pin. A far safer plan is to see what you are doing and to work with a dull pointed instrument.

(8) Do not trust to a skiagraph taken several hours before operating, for it is possible that the pin may have shifted its position in the meantime. Let the time between the skiagraph and the instrumentation be as brief as possible.

(9) That, safety-pins are not made of steel or magnetizable substances which preclude the use of a magnet.

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A CONSERVATIVE OPERATION UPON THE MODERATELY HYPERTROPHIED PROSTATE.

By H. McCLURE YOUNG, A. B., M. D., of St. Louis.

Cauterization through the endoscope for the relief of prostatic obstruction is a well-established procedure in Germany. The Goldschmidt operating urethroscope is the instrument commonly used. This has a lens system, a light at the distal end and a cautery knife, which can be exposed or concealed at the will of the operator. A stream of water is allowed to flow through the instrument and over the field of operation while the cauterization is in progress, washing blood and debris back into the bladder and giving the operator constantly a clear field of vision. The writer has seen this instrument in use in Frank's clinic in Berlin, and the objections he would make to it are the following. First, the lens system occupies so much space that the channel for irrigation must necessarily be small and the surgeon may therefore at times find difficulty in keeping his field of vision unobscured; secondly, the technique pertaining to its use is somewhat difficult; thirdly, its field of usefulness is very limited as the knife is small and has not a very wide range of movement; fourthly, it is an exceedingly expensive instrument and very easily gets out of repair.

The apparatus which the writer has employed for accomplishing the same purpose and in which all these objections have been modified or removed, consists of an ordinary direct vision Braasch cystoscope, which, of course, has no lens system so that the entire lumen of the instrument is available for irrigation. The surgeon, therefore, can hardly ever fail of a clear field of vision, even though the bleeding be considerable. Operating windows with a hole for the introduction of the cautery have been made for the writer by the manufacturers. The absence of a lens system also gives the surgeon the entire lumen of the instrument for his manipulations, so that he has a rather wide range and may cut for a considerable depth either below or on the sides as he sees fit. The writer has worked with the cautery knife and the cautery curette, as shown in the illustrations. It will be noted that the knife is straight, and is not curved like a Bottini knife. He believes that the straight knife is preferable, as the tip can be constantly kept in view, and it will be found that a median bar will rise against this knife as the beak of the cystoscope is withdrawn into the prostatic urethra. This would indeed occur with a perfectly normal prostate, the urethra

tending to resume its normal curve as the cystoscope is removed. In this manner, therefore, a deep incision can be made into the prostate with a perfectly straight knife, and there is no need of the Bottini curve. Fairly deep incisions can also be made into the lateral lobes by directing the cystoscope slightly toward one side or the other, so that the surgeon has rather a wide range of movement and a free play with his knife. The cautery curette is simply a loop made of very hard platino-iridium. With this it is possible to cut out ribbons of tissue corresponding to the size of the loop. As the ribbon of tissue ordinarily adheres to the loop, it can be removed at the end of each stroke, and the curette reinserted for the next incision, the cystoscope, of course, remaining always in position. In this manner it is possible to scrape away offending projections from the lateral lobes as well as from a median lobe. The Braasch cystoscope is also a urethroscope, and the surgeon is therefore enabled to prolong his operations as far forward into the prostatic urethra as he may elect.

The technique of this procedure, with the exception of a single point to be mentioned at once, is exceedingly simple. Anyone accus-

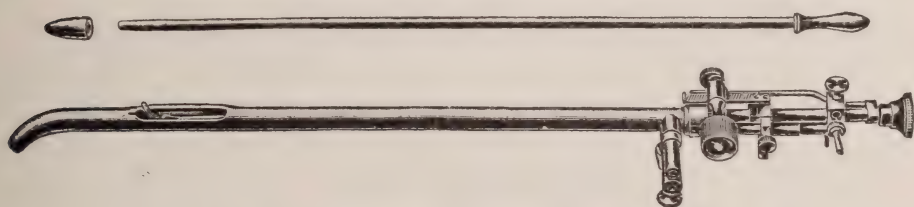


Fig. 1.—Goldschmidt Operating Urethroscope.

tomed to doing cystoscopy will master it at the first attempt provided his cauteries are working. This is the only difficulty and one which requires a very careful consideration. It should be said, however, at the outset, that each cautery is an instrument in itself and is not incorporated in the cystoscope, as in the case with the Goldschmidt instrument. It may, therefore, fuse or short circuit, or for some other reason fail to work and may then be immediately replaced by another, so that such an accident does not put the entire apparatus out of service. The cauteries, while not cheap and while liable to accidents, are nevertheless not of a price that is prohibitive, and repairs should not cost over two or three dollars.

The greatest care should be bestowed on the construction of these cauteries. There is, of course, nothing new or essentially remarkable about the use of a cautery under a stream of cool water. The electric current will heat the knives just as well in water as in air, but as water dissipates the heat somewhat more rapidly than air, it will require a considerably higher amperage to heat them up to a point where they will cut. When, however, the cutting is com-

menced and the knife is buried in the tissues it makes very little difference whether the surrounding medium is air or water. The danger, therefore, is that the knives will be overheated, and that when once buried in the tissues where the water cannot reach them they will fuse. This accident has to be guarded against by a careful preliminary testing to determine just how much current is necessary. A point will be found for every knife at which it will cut perfectly and with very little danger of fusing. A piece of raw lean meat in a bowl of water may be used as a phantom. The writer has found the uncooked gizzard of a chicken an excellent material on which to perform his preliminary tests.

Each cautery must be so constructed that no short circuits can occur within the instrument itself. If water penetrates into the instrument it will probably produce a short circuit. The distal end requires very special attention. If this is sealed with any ordinary cement, sufficient water will be taken up to give trouble, for cement is porous. It is indispensable that some material absolutely impervious to moisture be employed.

The cautery cord should be wound with some absolutely water-

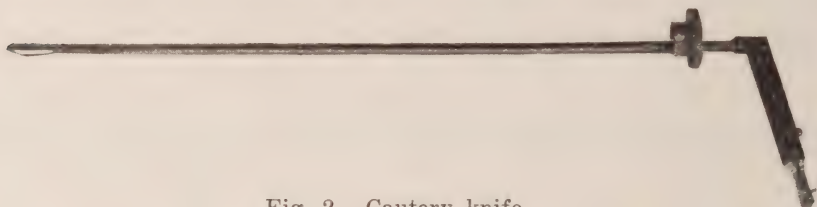


Fig. 2.—Cautery knife.

proof material, and the point of junction between the cord and the instrument should be covered over with a piece of rubber dam, otherwise the water which leaks out during the operation may cause short circuits along the cord and connections. With attention to these details the danger of embarrassing failures and delays can be reduced to a minimum.

The writer believes that this method will be found to have a fairly wide field of usefulness. One employing it for the first time will probably be surprised at how perfectly the irrigation clears the field, so that he may work for a considerable time almost unconscious of the hemorrhage. Projections of considerable size can be removed piecemeal with the curette, and deep incisions can be made where advisable. Just how wide this field of usefulness will be cannot, however, be stated with any certainty as yet. The writer has merely gone far enough to prove the entire practicality of the method for cases of moderate hypertrophy and in which cystoscopy itself is a feasible procedure. Those who employ the Goldschmidt technique claim for it that in properly selected cases it will give relief for from three to five years, after which the operation may have to be repeated. In some cases the relief is permanent. It

seems, therefore, apparent that at least this much may be confidently claimed in advance for the technique which the writer has described. He feels also quite certain that considerably more than this can be accomplished, or at least that the class of cases to which it is applicable will prove larger for the reason that a more extensive operation can be performed and considerable tissue actually removed. It seems also reasonably clear that this technique may profitably supplant that of the Bottini operation in the hands of those who still adhere to it. It is certainly free from the risks attendant upon a Bottini operation, for the reason that the surgeon can proceed slowly and cautiously and can see exactly what he is doing. The knives, while not as heavy as the Bottini knives, are nevertheless heavy enough to sink into the tissue quite rapidly and will doubtless cut as deeply as it is ever advisable to cut in any case. The writer will concede, however, that they are a little more likely to be fused than are the heavier knives, and for this reason he intends to have them made a little heavier in future, a thing which he is assured by his electrician is entirely feasible without

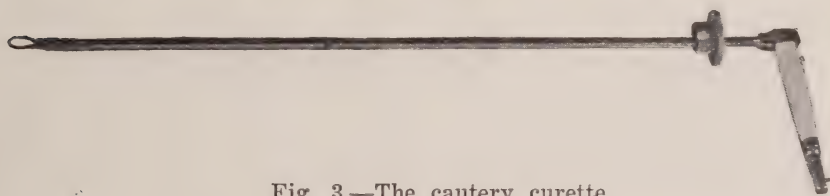


Fig. 3.—The cautery curette.

altering the calibre of the instrument. The fact that the operation is performed under running water protects all tissues not in actual contact with the electrodes, and as the irrigation is constantly renewed no danger of adding in any measurable degree to the temperature of the water in the bladder can exist. For this reason the surgeon need not fear to use water as warm as for any other cystoscopic procedure.

In conclusion, the writer would like to add a few words of caution for the benefit of those who may contemplate taking up this technique, and which may save them considerable time and annoyance as well as expense. In the first place, do not expect that your knives are going to turn red under water. This, of course, cannot occur. The first sign of developing heat will be a faint ebullition about the electrode. Very fine bubbles of steam will form and will be almost immediately recondensed by the cool water. The knife should now be laid against the phantom; let us assume in the present case a piece of fresh chicken gizzard. It will probably not take hold as yet. Cautiously the regulator of the transformer must be advanced notch by notch. If all is in order the ebullition will

become a little more marked, but will never be violent. Soon the knife will begin to sink into the tissue without any very appreciable resistance. You have now reached exactly the amount of current necessary for that particular knife, and the transformer should be left set exactly as it is. The current, however, must be turned off before the knife is removed from the water and not turned on again until the knife is in the bladder and firmly pressed against the tissues which you wish to incise. The current you are using is sufficient to fuse the knife instantly in the air. Furthermore, if during your tests on the phantom, a red glow should suddenly appear in the midst of the tissue, you may know that you are in imminent danger of losing your knife, and the current should be turned off immediately. This red glow means that your knife has become encased in a small pocket of steam; and as it is no longer protected by contact with either water or tissue, it will almost certainly be fused by the current necessary to do this work. Of course, this can only happen when the knife is rather deeply buried and the surgeon can protect himself somewhat by making his incisions

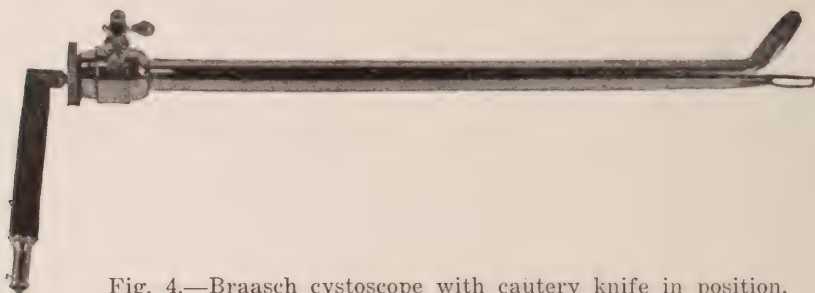


Fig. 4.—Braasch cystoscope with cautery knife in position.

wide open and rapidly. Perhaps it would be well, where a deep incision is contemplated, to have the transformer turned down a notch as soon as the knife begins to disappear. A reliable assistant at the transformer, who will respond instantly to the surgeon's slightest wish, will be found a great convenience and will save many knives and much vexation. Finally, if for any reason your cautery does not work at the point which you have previously established as the correct one, or if on your preliminary tests no ebullition appears at the point where it may reasonably be expected, do not attempt to force matters by turning on more current. To do so is simply to invite disaster. You have either a short circuit, a broken electrode, or a failure somewhere in your connections, and you must proceed methodically to determine where the trouble lies. It should be emphasized, however, that no harm can come to the patient in any case. When these knives fuse, there is simply a momentary glow deep in the tissues; the knife melts at some point and ceases to operate. There is never any explosion or anything of that sort.

When this accident happens in the bladder the surgeon will not see the glow, but will simply be aware that his knife is no longer working. The worst, therefore, is the loss of a knife which can be replaced at a cost of two or three dollars, or if the operator has no other cautery with him, he may have to postpone his operation. At best the surgeon must expect to burn out a knife occasionally, and he should, therefore, always take a number of these cauteries with him to every operation. The writer believes that the curette will be found more useful than the knife, for the reason that it will do about all that the knife will do, and quite a little more.

The writer has gone thus into detail that he may not be accused of minimizing the difficulties. He believes, however, that with an improved technique on his part and with a better knowledge of his requirements on the part of his electrician, the amount of his repair bills can be reduced considerably. Even as it is, the difficulties are not such as to form any great obstacle to anyone who is willing to give the problem the necessary thought and care. Let us suppose that the surgeon starts out with half a dozen cauteries—and this certainly ought to be enough to carry the most indiscreet man alive through any operation that he is likely to undertake by this method—his initial outlay may still be regarded as moderate when one considers the cost of Bottini instruments and Goldschmidt urethroscopes. With experience he will become increasingly aware of the pitfalls, all of which the writer believes have been mentioned above, and let us hope that the surgeon will then be able to go through many operations without an accident.

Of course, it is unnecessary to warn anyone accustomed to the use of electrically lighted instruments that the current for lighting the lamps and for heating the cauteries must not be derived from a common source. A word to the less experienced may not, however, be out of place. It is the writer's custom to light his own lamps from a series of dry cells. He also spares no pains to see to it that his patient is not 'grounded.' He insists that the cystoscopic table be elevated from the floor by four wooden blocks. The additional height which this gives the patient is so great an assistance to the surgeon in any cystoscopic procedure as to be well worth the trouble, and the knowledge that the patient is perfectly insulated removes definitely a source of apprehension which might prove annoying. However, there is, of course, no danger that the patient could in any case receive a sufficient shock to do him any harm.

NON-DIABETIC GLYCOSURIA.*

By SOLOMON STROUSE, M. D., of Chicago,Associate Attending Physician, Michael Reese Hospital; Instructor in Clinical
Medicine, University of Illinois.

The object of this paper is to emphasize the importance of searching for non-diabetic glycosuria and to report some interesting cases seen in the past few years. Properly to do this, it seems advisable to make a skeleton sketch of the subject and its relation to true diabetes mellitus, which is necessarily in great part not new.

The tendency of modern studies on diabetes is toward a more optimistic outlook for the therapeutics of the disease. This optimism is the result of more intensive study of the disease in individual cases and advanced knowledge of the fundamental chemical processes. It is not safe to assume that the presence of a reducing body in the urine spells diabetes. It is necessary first of all to identify the reducing body and then to classify the disease. It is very probable indeed that, even under the strictest application of the name diabetes mellitus, we are grouping more than one disease process, and certainly, if we are to hold out therapeutic optimism as a goal, we must first insist on separating the true diabetes cases from other complexes characterized by the excretion of a reducing body.

The first step in the practical application of this rule must be a means of identifying reducing bodies. Such identification is so absolutely necessary that there can be no excuse for neglecting it. The chemical procedures are simple; the apparatus required, with the exception of the polariscope, is only what is found in every clinical laboratory; and with so many laboratories equipped with polariscopes it is a simple process to send a specimen of urine for identification.

However, even if the reducing body is identified as glucose, the diagnosis of diabetes mellitus will depend on the clinical course and physical findings. It would be a most interesting subject for statistical study to attempt to follow up in detail the numerous patients who are refused life insurance because of the presence of glucose. There exist, for instance, certain types of transient glycosuria, possibly neurogenous, which in the beginning cannot be separated from true diabetes (von Noorden). In the maze of factors influencing carbohydrate metabolism, one could easily expect tem-

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porary derangement in sugar metabolism to follow unrecognizable functional disturbances, such as might be associated with one or more of the ductless glands. We know how frequently hyperactivity of the thyroid or hypophysis is associated with glycosuria; how easily an alimentary glycosuria arises in patients suffering from such maladies; and we know, from the work of Cushing and his co-workers, how important a rôle is played by the superior cervical ganglion. Little as is known concerning the sympathetic nervous system, we might expect a neurogenous glycosuria to be not uncommon. Possibly the following is such a case.

In 1907 the writer saw a patient, aged twenty-seven, a merchant, who was refused life insurance on account of what was called a 'severe diabetes.' The writer had seen this patient and had examined his urine many times without the slightest evidence of diabetes; but an examination, made the day after sugar had been first found, revealed the presence of a reducing body which was dextro-rotary and fermented by yeast. This was present to the extent of 1.5 per cent. on one occasion, and in varying amounts on succeeding examinations. After a few days it disappeared, and despite attempts to reproduce the condition by high carbohydrate feeding, by subjecting the patient to strenuous nervous and mental shocks, sugar was never again found. Since that time the patient has had urine examinations made frequently—all negative, and has been unreservedly accepted as a safe life insurance risk.

In cases of alimentary glycosuria, we have to differentiate between alimentary glycosuria *e saccharo* and *ex amylo*. Doubt may exist as to the significance of a glycosuria *e saccharo*, but when the sugar is excreted on a diet containing starch in excess, the probabilities of a true diabetes are great, and the time element must be carefully weighed. But even though this glycosuria be not constant, it is well known that many early cases of diabetes mellitus are characterized by transitory glycosuria. It is this fact of the transitory nature of the early stages of many diabetics which makes the diagnosis of neurogenous or alimentary glycosuria always difficult. Yet not all cases are diabetics.

Although mention has already been made of the glycosuria associated with hyperactivity of the ductless glands, the writer wishes to refer to this now in connection with so-called 'sugar tolerance' tests. Such tests have been practised for a long time, mainly in connection with functional diagnosis of liver disease. In a long series of observations as yet unpublished, Friedman and the writer have shown quite definitely that such a test as Strauss' alimentary levulosuria does not by any means specifically indicate functional liver disturbance, as it is frequently found in hyperthyroidism, hyperpituitarism, and other conditions. To be of value sugar tolerance tests must be carefully correlated with other clinical find-

ings, and their interpretation depends entirely on such clinical findings. The importance of these observations lies in the indication they give of the many possible causes of alimentary glycosuria *e saccharo*.

Of the temporary glycosurias occurring in the acute infections, nothing need be mentioned. The question of syphilis and diabetes is another matter about which there seems to be scant information. Apparently diabetes may occur in children tainted with hereditary syphilis, and occasionally it occurs *with syphilis*. Little is known, however, of the exact relative positions. Cases of diabetes on a syphilitic basis may or may not be caused by the preceding infection, but cases which are cured by antisiphilitic treatment are rare. In this connection the writer wishes to record a rather unusual case, in which the etiological relation seems established.

Mr. H., farmer, *æt.* fifty-eight, referred May 9th, 1913, by Dr. Duntley, of Bushnell, Illinois, because of 'diabetes.' Family history negative. All members were long-lived. Married; wife well. Three daughters, none of whom has children. Personal History: Pneumonia at twenty-seven. Always healthy, and very active. For past thirty years has led a strenuous life as a farmer and in politics. Uses no tobacco; moderate alcohol. In 1876 had a 'chancre,' for which apparently he received antisiphilitic treatment for about one year. Never had any secondaries, and was actually in such doubt as to whether he had had syphilis that he never told his physician; and the history was elicited in the writer's office only after an expression of doubt as to his present trouble. Past Illnesses: About eight years ago sugar was occasionally discovered in the urine—not constantly. He has never had increased thirst, or appetite, or polyuria. He held his weight until last summer (1912) when, after considerable worry incident to business affairs, he showed sleeplessness and anorexia, and lost 20 lb. in weight.

During these eight years he has been on no special diet, and has taken carbohydrates to excess. Dr. Duntley first saw the patient in February, 1913, on account of severe upper abdominal pain in left side, nausea, vomiting, diarrhea, sweats, chills and fever. The stools were milky in color. There was no jaundice. The writer did not see the patient in these attacks. His physician considered them pancreatic in origin. He had three such attacks in two and a half months. Urine examinations constantly showed sugar.

Present Examination.—The examination on May 9th, 1913, showed a large, well-built man, with a sallow complexion. A scar on the penis was the only positive finding. The Wassermann reaction was strongly positive.

The urine (twenty-four-hour specimen), 1560 c.cm.; acid, cloudy; specific gravity, 1025; albumin ++; dextrose, 0.66 per cent. (10.29 grm.); no acetone. Occasional hyaline casts. The diet for the day included toast at two meals, shredded wheat, apple pie and milk. Blood sugar determinations were not made.

The diagnosis here was a mild diabetes, probably on a syphilitic basis, and we advised pushing mercury and the iodides. In July the physician advised the writer that the patient was improving in general health; had no more abdominal attacks; and, despite the fact that he was not limiting his diet, had no symptoms of true diabetes. In November he was still further improved, and the Wassermann reaction was negative. Urine examinations usually showed no sugar.

The numerous toxic glycosurias need only be mentioned in passing—those due to morphine, chloral, chloroform, ether, adrenalin, phloridzin, carbon monoxide, uranium, chromium, etc. Occasionally the Germans report glycosuria associated with the drinking of beer or of champagne. Such cases, fortunately, occur only in those rare toppers who can imbibe as the inveterate smoker smokes—before breakfast. None of these conditions is common, nor can they be mistaken for diabetes mellitis. Phloridzin diabetes is a common experimental condition, which is differentiated from true diabetes in that it is supposedly renal in origin. In phloridzin diabetes the carbohydrate intake has no essential effect on excretion, and there is no accumulation of sugar in the blood.

In the human being there has been described a rare condition known as 'renal diabetes,' which has the characteristics of experimental phloridzin diabetes. For a case to be classified as one of renal diabetes it must fulfil the following two conditions: (1) The amount of sugar excreted is entirely, or almost entirely, independent of the carbohydrate intake; (2) the blood sugar is either normal or diminished.

Cases like this are, judging from the literature, extremely rare, and the writer will briefly report one such.

The patient is a young man, aged twenty-three, referred to the writer by Dr. A. H. Beifeld, on December 21st, 1912. A perfectly healthy man, he had been refused life insurance on November 6th and again on December 2nd, on account of sugar. Between December 2nd and 21st he had been under the care of Dr. Arthur Beifeld, and was on a restricted carbohydrate diet, with, however, sugar persisting and a rapid development of acetonuria. On careful inquiry none of the usual symptoms of diabetes are complained of. There is no thirst, no increased appetite, no polyuria, and no loss of weight. In fact, he felt as he always did—in unusual good health. About one year ago he was in an accident. He was thrown from a sleigh, landed on his head, and was unconscious for a few minutes. After the return of consciousness he was able to drive an automobile, but suffered from severe headaches for three to five days. There was no evidence of skull fracture, and complete recovery followed. The last urine examination before the accident was negative, and one before that of November 5th, 1912, was also negative. He had led an active normal life, always indulging in food as he wished. Denies lues. Typhoid five years ago.

Physical examination on December 21st, 1912, was negative. The patient was robust and to all appearances healthy. Eye grounds negative. Wassermann reaction negative. On December 24th, 1912, a twenty-four-hour specimen of urine showed the following: Alkaline; sp. gr. 1.016; no albumin; dextrose, 0.55 per cent.; faint trace of acetone; no diacetic acid. Microscopic examination negative.

The patient was kept on a moderately restricted diet (four to six pieces of bread a day) until January 1st. He passed from 0.2 to 0.5 per cent. sugar, and after a week of absolute restriction he still passed 0.5 per cent., and developed acetone and diacetic acid. Thinking that he was dealing with a severe type of disease, the writer placed the patient in the Michael Reese Hospital, where we were better able to study the course. Without going into details we found: (1) The patient passed sugar even on a carbohydrate-free diet; (2)

once only he became sugar-free—after a vegetable, oat regime (four days); (3) he developed acetonuria and clinical signs of acidosis quickly after the withdrawal of carbohydrate; (4) restriction of protein had no effect on sugar excretion; (5) on carbohydrate-free days and on vegetable days he excreted five to six grm. dextrose; (6) the addition of carbohydrate up to 200 grm. bread and potato caused no increase in sugar excretion; in fact, he excreted only half as much after twelve carbohydrate days as on the starch-free days; (7) despite continued sugar excretion, patient had no symptoms and lost no weight.

This evidence was against true diabetes, and we felt that we were dealing with an unusual type of metabolic disorder. The patient had to go to Europe at this time, and while there he placed himself under von Noorden. The observations just given were repeated and verified; and blood sugar determinations made at two different times—under restricted and full diet—showed “normal and the same values.”

To quote from a letter from von Noorden: “Following theory, one must classify the case under the so-called ‘renal diabetes.’”

Cases of renal diabetes are, however, so rare that even von Noorden, with his large clinical experience, refused to give a prognosis. Therefore, the subsequent history of this patient is interesting. There are no symptoms of diabetes; the patient has gained weight and feels in perfect health. The urine, no matter under what diet, contains sugar, despite which the patient continues to indulge in sweets of all kinds. A recent analysis shows 0.9 per cent. sugar.

An interesting addition to this story lies in its possible traumatic etiology. Clinically, traumatic diabetes cannot be differentiated from any other form of the disease, but in view of the connection between hypophysis and carbohydrate metabolism, and especially because of the case of Herrick, in which lumbar puncture relieved the polyuria of diabetes insipidus, the writer advised that lumbar puncture be performed. On July 30th, Dr. Dean Lewis kindly did the operation and removed 20 c.cm. of fluid, which was under decided pressure. The only effect this had was to produce an intense headache lasting twelve days. The fluid examined by Dr. Lewis gave no evidence of pituitary activity. In this case individual analysis prevented the physician from making a grave error. Were it a case of true diabetes mellitus, as at first considered, the prognosis would have been extremely grave. As matters stand now, the patient has been under observation for over a year, and no signs or symptoms of true diabetes have been noticed.

Passing now from glycosuria to conditions in which other sugars are passed, the writer feels safe in asserting that the more one looks for other sugars, the more frequent will be their occurrence. Perhaps the commonest sugar found is lactose in nursing women. Pentosuria has been frequently reported, in fruit-eaters and beer-

drinkers especially, but it has not been the writer's fortune to discover any such case. The least common type is levulosuria, and Friedman and the writer have reported in detail such a case. This patient, who has been under observation now for three years, still manifests no signs or symptoms of true diabetes, except that like many diabetics he has developed pulmonary tuberculosis. His urine for a period of six months at the Winfield Tuberculosis Sanatorium, under the high feeding there practised, showed no reducing body, but a recent examination showed a large amount of levulose, and no acetone or diacetic acid. Had we not determined in this case the nature of the sugar, we should have been at a loss to interpret the subsequent course of the disease.

SUMMARY.

From the standpoint of practical therapeutics, as well as from that of strict science, every patient in whose urine a reducing body is found should be individually studied. Careful analyses of the further chemical reactions of each reducing body will often show that the reducing body is not glucose, and that the condition is a comparatively rare anomaly in clinical chemistry. In addition to the urine study, careful clinical observation will often remove the stigma of diabetes mellitus from a person whose worst offense is that he is the test-tube for an innocent chemical reaction. It is only by means of this clinical and chemical correlation that science will be served, and, furthermore, it is only this combination which can hope to hold out that optimistic therapeutic goal which modern medicine offers to the diabetic.

104 South Michigan Ave.

THE SCAPHOID SCAPULA (GRAVES) AND ITS PROGNOSTIC IMPORTANCE FOR THE DURATION OF LIFE.*

By VICTOR KOLLERT, M. D., of Vienna.

In addition to the 'normal scapula' with the convex medial margin described in textbooks of anatomy, there are found types with a concave medial margin, the 'scaphoid scapula,' first described by Graves (*Med. Record*, May 10th, 1910). Such scapulæ also show other if less conspicuous anomalies of structure, and often are associated with abnormalities of other systems of organs (early arteriosclerosis, weakly developed musculature, thorax paralyticus, etc.).

A comprehensive account of the various theories concerning the scaphoid scapula being already accessible in the literature (Lance,¹ Kollert²), only certain questions will be considered here somewhat more particularly, as based on the study of a larger material.

First of all there is to be emphasized that not every scapula may be placed easily in either of the two classes, because there is a characteristic series of transitional forms. These forms will be described here more exactly, as the difficulty in assigning a given scapula to one of the two chief classes may be the cause of mistakes. I have so far succeeded in differentiating the following transitional forms:—

1. Intermediate forms in a stricter sense (Fig. 1 C), with medial margin quite straight, angle between spina and medial margin approaching a right angle, and inferior angle almost exactly below the most medial point of the spina.

2. Secondarily modified forms, as developed in cases of scoliosis through severe rachitis, etc.; sometimes these have so adapted themselves to the changed conditions that their original form is not to be determined with certainty.

3. Scapulæ with approximately S-curved medial margin. These have medially below the spine a short concavity continued below into a longer convexity, curving quite sharply in some cases (Fig. 1 D). The scapulæ are mostly broad and stout, the lower angle is obtuse like the normal, and lies lateral of the most median part of the spina. These are the forms most difficult to classify. On the one hand we find continuous transitions to the normal type, in that the

*From the Institute of Pathological Anatomy and the II Medical Clinic, Vienna. Translated from the German (*Wien. klin. Wochenschr.*, No. 51, 1912) by Theodore H. Romeiser, M. D., St. Louis.

concavity of the medial border decreases; on the other hand, there are transitions to the scaphoid form. In one of these groups there is a process of cartilage or bone at the junction of convexity and concavity. In one bone prepared by me this prominence was connected with a tendon of the subscapularis. These S-forms may account for the statement of Reye,³ that normal and scaphoid forms are observed in the same individual. The typical S-form is observed also not infrequently in old age and occasionally associated

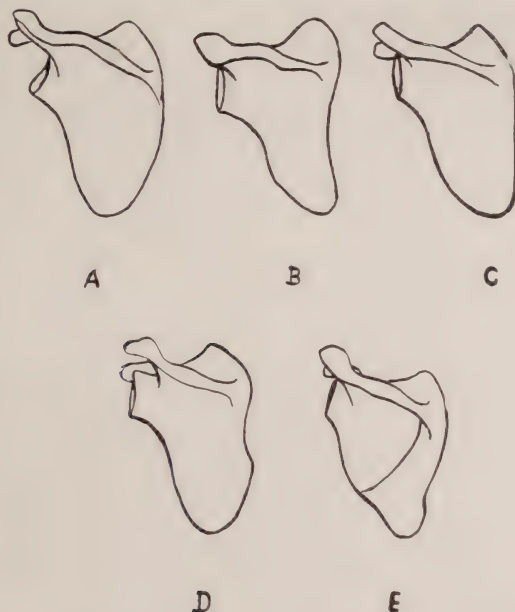


Fig. 1.—A—Normal form (Case 382, woman of fifty-two, lymphatic leukemia. Angulus medialis to angulus inferior 14.3 cm.).

B—Scaphoid form (Case 288, man of fifty-two, cerebral hemorrhage, scapula length 14.2 cm.).

C—Intermediate form (Case 783, man of thirty-one, tubercular meningitis, scapula length 17.3 cm.).

D—S-form (Case 561, man of twenty-five, pulmonary tuberculosis, scapula length 13.9 cm.).

E—Developmental form of scaphoid scapula (embryo 9 cm., cartilage length 7 mm.). Line from spina downward shows position of osseocartilaginous margin.

with well-developed thorax, two peculiarities common both to it and the normal form.

4. Fetal types which I consider a developmental form of the scaphoid scapula, to be described later (Fig. 1 E).

In regard to the morphology of this bone it is to be remarked that the angle between spina and medial margin depends not only on the type of scapula, but also on its relative size. Bones, short in proportion to the body, show a right angle even if the medial margin is typically normal.

The determination of the form of the scapula in an individual

is made decidedly easier by noting the position of the inferior angle. If this lies lateral of the most medial part of the spina we are dealing with a normal or an S-form. If it lies in the perpendicular below this point, we have before us a scaphoid or intermediate form. This is illustrated by the following partly schematic figures.

In order to bring out the medial margin of the scapula, one may have the subject place his hand on the opposite shoulder, or one lightly presses the shoulder backward. These methods fail only in fat individuals.

In most persons both scapulæ seem quite symmetrical in form. In about one-third of my cases there were found differences in form between the two sides; for instance, right normal, left S-shaped; or right intermediate, left scaphoid. Only once, in a 35 cm. fetus, did I see a typically normal scapula on one side with a typically scaphoid scapula on the other; however, this occurrence is so rare that practically it may be ignored.

If we are to understand the significance of the scaphoid scapula, we must be informed about its formal and its causal genesis. According to Schwalbe,⁴ by the first we understand the individual developmental history of a malformation which we reconstruct after the finished product on the basis of our ontogenetic knowledge (*entwicklungsgeschichtlichen Kenntnisse*). The first question is, therefore, when does the abnormal form of the shoulder-blade develop? The following possibilities are provided during the development of the bone: the cause may be irregularities in the 'anlage' of the precartilaginous, cartilaginous and ossifying centres; the origin may be during intra-uterine development after the preformation (anlage) of these centres, or finally, after birth. The opinions of authors who have discussed this point are not in agreement. Graves⁵ concluded that the scaphoid scapula is formed during the fetal period, and I followed him in this regard in my first publication. Kellner⁶ assumed an influence of the musculature on the development of the deformity, since in his material the weak-muscled patients, incapacitated for work, showed a much higher percentage of scaphoid forms than the healthy robust individuals. He seems also to entertain the possibility of an extra-uterine development. Reye assumes the same on the basis of 2 cases observed.

Concerning the position of the precartilaginous, cartilaginous and ossific centres, I have no remarks to make. In my youngest cases (fetuses 8 cm. long) the two original centres of ossification (Rambaud and Renault⁷) were already blended into a single centre and always showed the same convex margin; but the form of the cartilage varied, showing the different forms of the later bone above described. In a few other cases I also found a type not observed so far in adults and which I consider a developmental form of scaphoid scapula (Fig. 1 E). In this specimen there is at the

medial side of the inferior angle a narrow process of cartilage directed medially and inferiorly. If we imagine the lower part of the cartilage growing in the direction of this process, we would get an inferior angle lying below the most medial part of the spina scapulæ and a concavity at the medial margin—the chief characteristics of the scaphoid scapula. We have here probably the beginning of the development of the scaphoid type. Such forms are most easily found if embryos under 12 cm. are examined. In such I have been able to observe so far only the typically normal and the 'developmental' forms (however, my material is not very large). Whether all scaphoid scapulæ develop in this manner, I cannot say with certainty. In agreement with the assumption that we have here a transitory form is the fact that we have seldom seen it in fetuses over 20 cm. in length and probably never in adults. (This form was first differentiated rather late in the course of the investigation.) Since the lower six serrations of the musculus serratus anterior are attached to the inferior angle, they may play a rôle in the development of the scaphoid form. Whether a variation in the development of the muscles or an abnormal softness of the cartilage is the chief factor, I cannot say. Rachitis plays no rôle in the development, as is clear for many reasons. The histological appearance of the osseocartilaginous margin at the place of the greatest concavity of the medial border, in comparison with normal fetuses of the same age, shows no notable differences, above all no indications of those changes described by Sumita⁸ as signs of inhibited development in his rib specimens.

There still remains to be answered the question whether a scaphoid form sometimes develops during extra-uterine life, as for instance Reye supposes. As proof of this he adduces 2 cases of encephalitis and abnormal scapulæ, the parents, brothers and sisters in good health having normal scapulæ. He considered the encephalitis the cause of the abnormal bone development, since no other noxious factor could be discovered. To assume a definite harmful factor to be the cause of a deformity seems to us, however, to be practically impossible so long as its proximate conditions of development are still not clear. In a fourteen-year-old boy observed in the clinic, with the residua of an encephalitis and marked scaphoid scapulæ, the scapula of the paralyzed side was checked in development so as to be $11\frac{1}{2}$ cm. shorter than the other, measured from spina to inferior angle. His parents and brothers and sisters could not be examined. Since one may assume that the scapula whose development was inhibited would maintain its original form rather than the one which continued to develop, both being equally concave, it is concluded that the encephalitis appeared in this case after the scaphoid form had already been developed. Were we to suppose with Kellner that weakly developed musculature or deficient exercise may be the cause of the abnormal form, we should

have to consider chiefly an atrophy of the bone. But certain peculiarities of the scaphoid scapula, for instance the position of the inferior angle, do not seem explicable on this basis. In conclusion, we may say that so far only the intra-uterine development of the scaphoid scapula has been determined with certainty.

Still more difficult than the investigation of the formal is the elucidation of the causal genesis, the question through what influences the disturbance in development is brought about. Graves proposes the theory that syphilis of parents or more distant progenitors is one cause of the anomaly. Among the 250 clinical cases of my first publication, there were 15 with keratitis parenchymatosa and a number of children whose parents had lues available for the study of this question. In all these cases I found scaphoid or intermediate forms and believed I could therefore agree with Graves' theories. Kellner and Reye investigated from the other direction by determining the Wassermann reaction in bearers of scaphoid scapulæ, finding it positive in only a small number of cases. Shortly after ending my work I was able to observe normal scapulæ in a man who said both his parents had died in an asylum with the diagnosis 'paralysis of the insane.' This led me to study the question anew and to examine the scapulæ in all available cadavers of congenitally syphilitic children sectioned at the Pathological Institute. The material was divided into three groups (Table I), according to the greater or less certainty with which lues was determined in each case.

TABLE I.

	Normal	Intermediate	Scaphoid
1. The autopsy or the histological findings showed unquestionable lues....	9	4	7
2. Lues determined clinically without pathological findings, in part cases treated with salvarsan.....	2	3	1
3. Macerated embryos not autopsied...	11	5	7

Collectively there were 15 cases (30.6 per cent.) of scaphoid scapula in 49 of lues. In considering the significance of this number it should be noted that scaphoid scapulæ were observed in 71 (27.3 per cent.) of 260 born dead or dying within four weeks post-partum, which were not autopsied or in which the necropsy did not show lues. In view of these figures it is at present impossible for me to arrive at a definite conclusion concerning the rôle of syphilis in the causation of the scaphoid scapula.* Reye supposed tuber-

*Graves has shown by comparative clinical studies of whole families that syphilis is one cause and that heredity is another cause of the scaphoid scapula. He assumes that any factor capable of affecting adversely either the germ plasm of parents or the earliest development of the organism may cause the anomaly.—Translator.

culosis, alcoholism and neuropathic heredity to be further causes of this malformation. So also in the literature of the scaphoid scapula we find views analogous to those held in regard to the most diverse malformations: a given abnormality is supposed to be caused by a great variety of diseases, each of which on the other hand is assumed to be the cause of the most diverse forms of abnormalities. The proximal genetic conditions are still quite obscure, and hence the question of the cause cannot be answered definitely for the present.

Before discussing the question whether the presence of the scaphoid scapula in man permits certain conclusions concerning the individual as a whole, the comparative relations of both typical forms must be discussed. For a number of reasons the two types are to be considered as fundamentally different: 1. We find extreme forms of both from embryo to old age. 2. In spite of the large number of cases examined clinically and anatomically during two years, I observed only once both types in one individual—namely, in the above-mentioned fetus. 3. Several cases of double monsters examined showed all four scapulæ of like form. 4. That the scapula maintains during growth the type that it had during youth I could see in two cases. The case of encephalitis mentioned above had on both sides marked scaphoid scapulæ, of which that on the paralyzed side was $1\frac{1}{2}$ cm. shorter than the other. A similar condition was observed in a woman with residua of a poliomyelitis anterior acuta in whom the difference was 4 cm. Her scapulæ were slightly concave at the medial margin. 5. After about the twenty-fifth year the scaphoid form becomes rare suddenly, as is evident from statistics below. Since at this time development is completed, the assumption of change in form by further growth factors seems untenable. For these reasons it seems to me justifiable to conclude *that the scaphoid scapula is something fundamentally different from the normal form in so far as the one form never changes into the other during extra-uterine life. Man, therefore, retains until death the general form of scapula which he has at birth.*

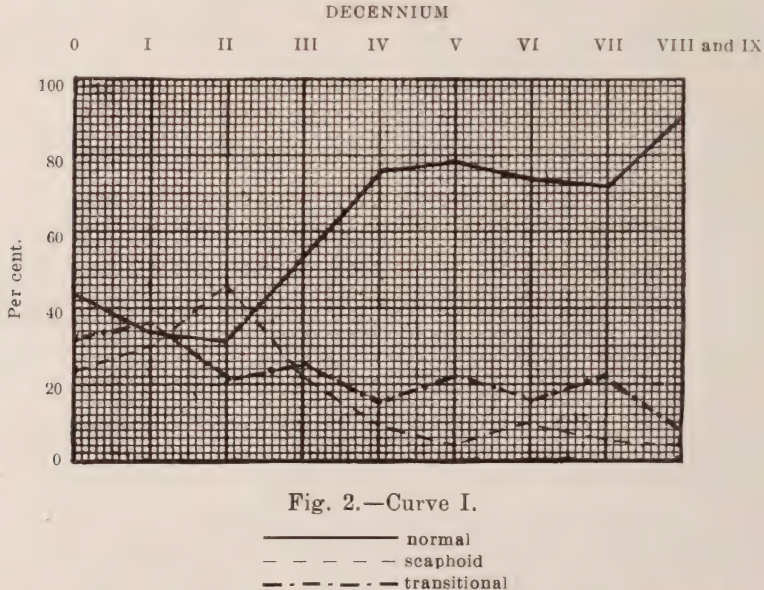
Even in the first article on this theme it was noted that scaphoid scapulæ are observed remarkably often during clinical examinations of young persons having marked pathological changes of inner organs, whereas this form is observed seldom in older people. Graves also observed the same in his material in North America, and Reye in North Germany. Since the indubitable determination of this fact seemed to me of practical importance because it would permit even in the newborn a prognosis regarding longevity, although a very conditional one, a larger cadaver material was examined with regard to the nature of the scapulæ in order to test the biological significance of these observations.

The method followed was to palpate carefully the medial margin spina, and angulus inferior and, when necessary, to confirm the result by dissection through an incision parallel to the medial margin, as in cases of obesity, edema or powerful musculature. Bodies were examined in the order in which they were received at the morgue, without any selection. The classification followed was that of the groups at the beginning of this article. Bodies having one scapula of extreme form and the other transitional were classed uniformly with the former. The transitional forms were counted together. The numbers in parentheses under the first decennium indicate post-partum deaths within four weeks. These were counted separately, as in development they often resemble those of stillborn children more than the others of their own group.

TABLE II.

Decennium.....	O	I	II	III	IV	V	VI	VII	VIII and IX
Normal.....	84	58(40)	14	67	74	92	98	42	30
Transitional....	66	61(33)	10	32	25	27	20	13	3
Scaphoid.....	47	52(39)	22	26	17	4	12	3	1
Total.....	197	171(112)	46	125	116	123	130	58	34 1000

The following curve expresses the relationship of the several forms of scapulæ for each decennium in percentages of the total for that decennium.



The table and explanatory curves show that the scaphoid forms are relatively frequent up to the thirtieth year; between the tenth and twentieth years they comprise nearly half. After thirty, however, the scaphoid scapula is the exception. These relations stand out quite clearly, if one excludes all cases atypical in any way and compares the typically normal with the scaphoid forms. There re-

main then 442 cases which are grouped according to age as follows:—

TABLE III.

Decennium.....	O	I	II	III	IV	V	VI	VII	VIII and IX
Normal.....	51	31	8	38	51	63	58	21	19
Scaphoid.....	33	33	14	9	5	3	5
Total.....	84	64	22	47	56	66	63	21	19

In judging the significance of the tables a source of error is to be noted, for disposition and exposure to the disease were not differentiated because the cause of death alone could be utilized in

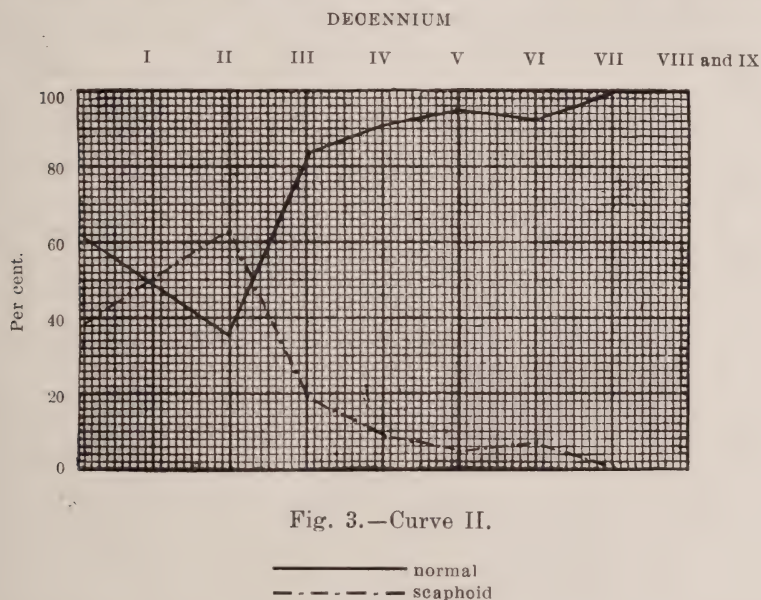


Fig. 3.—Curve II.

determining the constitution. However, the resulting error would not be great enough to invalidate the table, for the clinical examination of numerous patients also gave a similar result. Moreover, observations of Graves and Reye in other countries agree essentially with the conclusions derivable from the tables. Accordingly, the following conclusion drawn from the curve seems justifiable: *The probability of the newborn child attaining old age is decidedly greater if it has normal scapulæ than if it has scaphoid scapulæ.*

The distribution of the different forms according to sex was as follows:—

TABLE IV.

	Normal	Transitional	Scaphoid	Total
Male.	284 (59 %)	123 (25.5%)	74 (15.5%)	481
Female.	284 (54.7%)	125 (24.1%)	110 (21.2%)	519

Hence the number of scaphoid scapulæ was greater among women than men.

Of 1,000 cadavers examined, 313 (mostly stillbirths) were not autopsied. The remaining 687 cases were classified according to the cause of death, in order to determine possible relations of particular diseases to the scaphoid scapula as follows:—

TABLE V.

	Normal	Transitional	Scaphoid	Total
Tuberculosis.....	86	29	36	151
Malignant Tumor.....	97	26	15	138
Acute Infection*.....	123	43	36	202
Atrophic Cirrhosis + Nephritis..	17	3	..	20
Various Conditions.....	130	27	19	176

*Including vitium cordis after endocarditis.

Only tuberculosis and carcinoma shall be considered here at greater length. The frequency of the first in persons with scaphoid scapulæ has already been emphasized by Graves. In our material tuberculosis occurred 36 times (33.9 per cent.) in 106 scaphoid cases, 86 times (19 per cent.) in 453 normal cases. The forms of tuberculosis, in so far as they were determinable from the autopsy reports of the Institute, are shown in Table VI. The class 7 of the same comprised completely healed and walled off lung foci, *i. e.*, incidental findings during the autopsy.

TABLE VI.

	Normal	Transitional	Scaphoid	Total
1. Miliary tuberculosis.....	5	5	8	18
2. Chiefly cheesy form.....	24	8	11	43
3. Phthisis fibrocasseosa.....	31	12	6	49
4. Chiefly fibrous form.....	10	1	4	15
5. Special forms.....	10	2	5	17
6. Not classified.....	6	1	2	9
7. Tubercles.....	30	11	5	46

Of these 116 normal 41 scaphoid

Tendency to healing.....	(3+4+7)	71 (61.2%)	15 (36.5%)
No tendency to healing.....	(1+2)	29 (25 %)	19 (46.3%)

Only prolonged careful clinical examination may enable us to learn what conclusions may be drawn from these figures for prognosis in a given case of tuberculosis.

Schmidt,⁹ in his studies on carcinoma, found, in carcinoma of the gastro-intestinal tract, patients to be mostly of robust constitution and broad habitus after the fortieth year, but mostly of a phthisical aspect before forty. Cohnheim¹⁰ also found the adynamic type very rarely before the fortieth year. Since the scaphoid scapula is found almost exclusively in persons with weaker thoracic development, perhaps the present material may furnish some additional data relative to this question.

So the 122 cases of carcinoma, remaining after the subtraction of 16 sarcomata from 138 malignant tumors in Table V, were arranged according to age and form of scapula. The number of carcinomata of the digestive tract, totaling 60, were placed in parentheses after these.

Decennium.....	I	II	III	IV	V	VI	VII	VIII and IX
Normal.	2(1)	8(4)	20(7)	36(28)	18(4)	5(1)
Transitional.	1(1)	2	9(4)	4(1)	3(3)	1(1)
Scaphoid.	2(1)	4(2)	1	4	1(1)

This table shows that the scaphoid scapula is rare in cases of carcinoma. But possibly this holds only with the exception of youthful cases. This fact may explain at least in part the findings of the two authors mentioned above.

Graves already had found after careful clinical examination that signs of a congenital constitutional inferiority were absent in but few individuals having marked scaphoid scapulæ; an observation which has been repeatedly confirmed. Therefore my material also had to be examined in this direction. In those autopsied cases in which the clinician could diagnosticate 'status hypoplasticus' and the pathologist then noted many findings indicating constitutional inferiority, the normal type of scapula was found very seldom. In those cases in which the anatomist found abnormalities of one or more organs in the sense of status hypoplasticus (for instance, embryonic kidney lobulation, lung incisures, etc.), both forms of scapulæ occurred about equally often, although no regular connection with definite anomalies could so far be determined (Bartel¹¹). Mostly normal forms were found if the autopsy findings were only status thymicolymphaticus—namely, no real hypoplasia. Stiller's description of the general bodily constitution in morbus asthenicus corresponds in many points with Graves' syndrome of the scaphoid scapula. In this connection a number of cases examined (about 50) showed no parallelism between the tenth floating rib and the abnormal form of the scapula. (The sources of error in such examinations pointed out by Feldman¹² were considered.)

Control observations made by others after the appearance of my first contribution to the present theme permitted the appearance of two criticisms against the worth of the symptom, in so far as made known to me verbally. In the first place, the scaphoid scapula occurred too frequently to permit sweeping conclusions relative to its presence. In the second place, it was sometimes absent in indubitable degenerates.

In regard to the first point one should consider that in the interpretation of such a sign only the most marked cases should be utilized. However, we find these not so frequently. In the statistics of 691 individuals dying after the fourth week post-partum, but 98 (14.2 per cent.) had scaphoid forms at all, and only 54 (5.4

per cent.) of all the 1,000 cases showed marked concavity of the medial margin of the scapula.

As for the second criticism that the abnormality is absent in some few undoubted degenerates, it seems to me this speaks rather for than against the worth of its appearance; for then we could perhaps hope to learn to differentiate different forms of degeneration through careful clinical analysis.

The foregoing may be summarized as follows:—

1. The scaphoid form of scapula—characterized by a concave medial border and an angulus inferior lying in the perpendicular below the most medial point of the spina—is an abnormality originating in intra-uterine life. Its proximate conditions of development are still obscure. The form of the bone at birth remains in general unchanged during extra-uterine life.

2. The scaphoid scapula is the sign of a congenital constitutional inferiority of the individual. Its bearers die in early years mostly; hence the abnormality occurs very seldom in old age.

3. The morbidity from tuberculosis is great in persons with scaphoid scapulæ; the acute forms of the disease seem to predominate.

4. Between the normal type with convex medial border and the abnormal form there are transitions which may be the cause of errors in classifying a given case. Both typical fundamental forms probably never occur in one individual during extra-uterine life.

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MEDICAL AND SURGICAL PROGRESS.

THE ROENTGENOLOGICAL DIAGNOSIS OF DUODENAL ULCER.

A Review of Recent Literature.

By WM. ENGELBACH, M. D., of the Editorial Staff.

1. Cannon (*Amer. Journ. Physiol.*, Vol. XX, p. 289, 1907).
2. Carman (*Journ. Amer. Med. Assoc.*, p. 981, 1914).
3. Childs (*Colorado Med.*, p. 68, November, 1913).
4. Cole (*Arch. Roent. Ray*, p. 427, April, 1912; *Med. Quart. Roent.*, December, 1911; *Journ. Amer. Med. Assoc.*, p. 1419, 1914 and Vol. LXI, p. 762).
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10. Hulst (*Amer. Quart. Roent.*, p. 9, January, 1907).
11. Leonard (*Amer. Journ. Roent.*, p. 29, November, 1913).
12. Marbaix (*La Cellule*, Vol. XIV, p. 251, 1898).
13. Mayo (*Journ. Amer. Med. Assoc.*, p. 556, August 15th, 1908).
14. Mering (*Verhandl. des Cong. fuer inn. Med.*, Vol. XII, p. 471, 1893).
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Roentgenology has thrown a remarkable light upon the diagnosis of gastric lesions. X-ray examination of the bismuth-filled stomach has proved so valuable that no other one means of diagnosis compares with it in accuracy. Identification and differentiation of stomach diseases and their complications have been so greatly advanced by the roentgenologist's work that positive diagnoses are being made of the above lesions which but a short time ago could only have been suspected. This has been due, to a large extent, to the demonstration of direct evidence of the lesion itself. Indirect evidence pointing toward a gastric lesion, such as disturbances of the gastric function—motility, secretion, or size and

position of the stomach—have been depended upon, to a less degree, as diagnostic evidence. For instance, gastric ulcers are demonstrated upon the fluoroscopic screen or skiagraphic plate as producing certain definite defects in contour of the bismuth shadow, such as niche, diverticulum, and malignant diseases by gross filling-defects, etc.

While there has developed considerable agreement regarding the value of these *x*-ray signs in gastric diseases, there still remains much contention regarding the value of the different signs, symptom-complexes and other *x*-ray evidence bearing upon diagnosis of duodenal lesions.

Perhaps the greatest difference of opinion has been the subject of accepting the value of direct or indirect evidence of these lesions of the duodenum. By direct evidence is meant the actual demonstration of definite anatomical defects of the lesion in the duodenum by means of serial skiagraphic pictures. The indirect evidence, obtained mostly by fluoroscopy, pertains to the anomalies of gastric and duodenal functions, particularly to the motility of the stomach and duodenum.

This review covers the literature from February, 1914,* to the present time, and gives the discussions of the supporters of both theories. These arguments have been arranged so that their contention will bring out points upon the diagnosis of duodenal lesions.

In reviewing the anatomy and embryological points of the duodenum, Cole states that the peculiar function and diagnostic significance of that region known as the first portion of the duodenum has heretofore not been fully comprehended. It has none of the characteristics of the descending and horizontal duodenum. On the contrary, it corresponds so entirely in contour with the pars pylorica and has so many characteristics of the stomach that roentgenographically one is compelled to consider it a continuation of the stomach itself. These points were fully described by Cole in an article in which the term 'pyloric cap' was first applied to the first portion of the duodenum.

Cole states his reasons for referring to this region as gastric rather than duodenal. Embryologically it has long been recognized that the upper portion of the duodenum is stomach rather than intestine. Mayo calls attention to the fact that "in the early state of fetal existence, the duodenum above the common duct is part of the pyloric end of the stomach. Coming from the primitive fore-gut, it is associated with the stomach in its physiology and pathology, and it is not part of the small intestine, which comes from the mid-gut."

Anatomically, the first portion of the duodenum differs materially from the descending or horizontal portions. Dwight observes that the first or ascending portion of the duodenum has a strikingly different appearance from the second and third portions, which present numerous small, irregular folds, particularly on the posterior aspect.

Schwarz calls attention to the dilatation of the pars superior duodeni as observed roentgenographically, and from anatomical and histological studies notes the resemblance between it and the stomach. (1) The pars horizontalis superior has a smooth inner wall,

*The literature prior to this date was reviewed by Skinner in the February, 1914, issue of the JOURNAL.

presenting the delicate, striped, longitudinal folds of the stomach lining. The ring-like folds characteristic of the upper part of the jejunum are not present but appear first in the upper portion of the descending duodenum; (2) together with the stomach, it is attached to the liver by the gastroduodenal hepatic ligament; (3) histologically it resembles the pars pylorica in that the glands of Brunner are found here in abundance. Physiologically, the contents of the cap are acid, like the chyme in the stomach.

Surgically, 95 per cent. of the ulcers which occur beyond the pylorus are found in the first 1 1/2 in. of the intestine—namely, the cap. They should, therefore, be described as postpyloric rather than as duodenal ulcers.

The first roentgenograms presenting the cap were exhibited by Hulst in 1906, to illustrate his presidential address before the American Roentgen Ray Society. Its roentgen shadow, however, so closely resembles the pars pylorica that Hulst interpreted this postpyloric region as the pyloric antrum. The dimensions of the cap, like those of the stomach, depend partly on its distention during different stages of digestion, different phases of the cycle and different stages of duodenal peristalsis. The posture of the body also influences its size, shape and position. The roentgenographic appearance of the cap is of inestimable value in the recognition of gastroduodenal lesions. Variations resembling pathological deformities are often seen in some of the plates of each series, but these can be readily recognized and definitely differentiated from organic changes. The small indentation frequently observed either on the right or left side of the cap may be due to pressure from the descending portion of the duodenum, the common bile-duct, or the vena-porta. Spasmodic contraction of the cap is often the result of ileac stasis, Lane's kink, or a diseased appendix. Incomplete filling of the cap may be caused by overactive duodenal peristalsis. This is more likely to occur in the early stage of digestion, when the pyloric sphincter is strongly contracted, than in the later stages, when the sphincter is relaxed and the gastric peristalsis more efficient, even though less active.

The function of the cap is that of a reservoir. It receives the acid chyme propelled through the pylorus during the systole of each cycle. During the early stage of digestion, the chyme is rapidly withdrawn from the reservoir cap by a rather broad periodic peristaltic contraction which propels it through the duodenum, possibly caused by the alternating alkaline and acid reactions in this portion of the intestine. As digestion progresses the cap is more completely filled with the acid chyme, and considering the presence of Brunner's glands, it is probable that the finishing touches of gastric digestion are received here by the small portion of chyme thus isolated from the bulk of food in the stomach.

The cap is separated from the pars pylorica by a space varying from 1/8 to 1/4 in., indicating the pyloric sphincter. The importance of its roentgenographic appearance is second only to that of the cap in the diagnosis of lesions in this region. Both its gastric and duodenal surfaces should be smooth and clear-cut, and the lumen should be centrally located. The amount of contraction of the pyloric sphincter is clearly defined roentgenographically. As a rule, it is in proportion to the activity of the gastric peristalsis, that is, when the gastric peristalsis is feeble, the contraction of the

sphincter is weak, and when the gastric peristalsis is strong, the sphincter is more tightly contracted. Alteration in the balance between the contraction of the sphincter and the tone of the stomach is one of the functional disturbances of the pylorus which can be recognized roentgenographically. It causes either a retention of food or an unusually rapid evacuation of the stomach with dilatation of the cap, and sometimes dilatation of the duodenum and jejunum. In the earlier stages of digestion when the gastric peristalsis is active, the muscle of the pyloric sphincter contracts tightly. As peristalsis grows feebler, the contraction of the sphincter becomes less tonic, until, during the later stages of digestion, it is greatly relaxed and its lumen comparatively large.

The motor phenomenon of the pyloric sphincter forms the heart of this communication. Cannon refers to the sphincter as the "keeper of the gate"; and before seeing his appropriate term, Cole referred to the sphincter, in a previous communication, as a butler, guarding the entrance to the intestine, and allowing only such food as is properly prepared to be served to the intestine. More recent observations, however, lead him to believe that the pylorus is not the only or the most important factor in replenishing the descending and horizontal duodenum.

Several important questions regarding the function of the sphincter and its relation to the evacuation of the stomach should be considered here. Some of them have apparently been settled conclusively by careful physiological observations. The question of whether or not the pylorus relaxes and contracts periodically, independently of each peristaltic contraction, has been considered so definitely proved in the affirmative by careful physiological observation that the energies of investigators have been directed solely toward determining the factors which control its contraction and relaxation.

In accordance with Mering's theory of a rhythmically opening and closing sphincter, Cannon describes the motor phenomena of the pylorus as follow: "Wave after wave passes with almost no perceptible variation of depth. Yet as the waves are passing with such notable uniformity, the pylorus may open before the pressure of an approaching constriction, and the mass then in the antrum thus released will be driven forth into the duodenum. The next wave and perhaps many thereafter of approximately the same depth may fail to press the food onward." Schicker doubts a rhythmically opening and closing pylorus and believes that the pylorus is open only during the relatively short duration of the antrum contraction.

From a careful study of more than twelve thousand serial roentgenograms of about 500 cases, Cole was unable to detect any such relaxation and contraction as has been described, but it may be contended that this is only a sudden squirt and that therefore none of the twelve thousand roentgenograms showed the sphincter during relaxation. This criticism would be hard to disprove unless some other method of evacuation can be demonstrated. A study of all these roentgenograms shows that during the systole of every gastric cycle, the pylorus is open, and through its lumen, which varies from 1.8 to 3.16 in. in diameter, a small amount of the liquid chyme is propelled into the reservoir cap. This period of expulsion consumes approximately seven-tenths of the cycle. The other

three-tenths of the cycle is occupied by the diastole. The terminal peristaltic contraction, which has meanwhile been advancing toward the pylorus, now attains the sphincter and effects its closure, so that the lumen is entirely obliterated, or visible only as a hair line. Thus the chyme in the cap is mechanically prevented from dropping back into the stomach when the patient is in the erect posture.

A further question to be considered is what factors other than the sphincter and gastric motor phenomena have a direct influence on gastric evacuation. According to Marbaix the duodenum exerts the influence for the replete intestines on the closing of the pylorus. Mering concludes from his investigations that the filling of the small intestine reflexly retards the emptying of the stomach. Schicker is also of the same opinion. The roentgenographic findings indicate that this reflex from the replete intestine is practised, not on the pyloric sphincter, but on the contraction which withdraws the chyme from the reservoir cap, as the duodenum is replenished from the cap and not from the stomach. During the later stage of digestion the cap retains its maximum content. Apparently, therefore, duodenal receptivity controls the evacuation of the cap through duodenal peristalsis rather than the evacuation of the stomach through a pyloric reflex.

Whether the rapid withdrawal of chyme from the cap during the early stage of digestion results from its slight acidity or its fluidity or is demanded by the hungry intestine below is beyond the sphere of the roentgenologist.

Cole believes that the hungry intestine is an important factor, because when the food reaches the ileum, the activity of the duodenal peristalsis is much diminished and consequently the cap retains more and the jejunum receives less than during the early stage of the digestion. The descending and horizontal portions of the duodenum are so radically different from the cap that he does not think of them as portions of the same organ. The difference is more obvious in the roentgenograms, in which the function of each portion is shown, than in the study of the anatomy or casts of the duodenum. The dilation of the cap into a reservoir corresponds with the casts, which, however, do not produce the contraction of the functioning descending and horizontal portions. When there is sufficient retention to distend the duodenum the ring-like appearance is distinctly shown. A sufficient retention to show these rings occurs so infrequently, however, that one is compelled to consider it abnormal and probably the result of obstruction by the root of the mesentery, or by adhesions from a gastric ulcer on the posterior wall of the stomach. The fact that these circular folds move, or are moved, is clearly demonstrated by serial roentgenography.

When, as is frequently the case, the descending duodenum passes down the pars pylorica and is obscured by it, a roentgenogram, taken in lateral direction, as suggested by George, of Boston, will bring it into view. If the cap is displaced posteriorly, it may present in these plates, although it fails to show in the anteroposterior roentgenograms either in the prone or erect posture.

The roentgenographic findings of the horizontal portion of the duodenum correspond more accurately with the anatomical descriptions than do those of the cap or descending duodenum. The distal

end, at which it joins the jejunum, is usually obscured by the pars media. The diagnostic importance of this region is emphasized by Codman in his article on chronic obstruction of the duodenum by the root of the mesentery.

Cole claims that frequently one can detect the duct of Wirsung, and in a few cases the ampulla of Vater has been distinctly shown. This is not only an interesting scientific fact, but is also of practical importance. When the bismuth remains in this duct or ampulla after it has left the duodenum, and even after it has passed out of the entire tract, it might readily be misinterpreted as a renal or biliary calculus, or as a bismuth adherent to or lodged in the crater of an ulcer. He makes a preliminary report on an improved method of duodenal examination. The patient swallows an Einhorn pyloric dilator. This is a small ball attached to a small rubber tube. Near this ball is a small rubber bag which collapses around the tube just behind the ball. This is as easily swallowed as the 'old fashioned pill,' and may be administered with food the day before the examination, or given a short time before the examination when the patient assumes a position which will readily allow it to pass into the duodenum and jejunum.

The small rubber bag is surrounded by a silk bag about the size of the lumen of the duodenum, is then inflated with air and acts as an intestinal obstruction; bismuth and buttermilk is then given by mouth and passes readily into the duodenum. The temporary obstruction prevents the bismuth from passing on through the jejunum. The duodenum is dilated by the bismuth and buttermilk, and a radiogram shows perfectly the contour of the dilated duodenum. If any portion of the duodenum is held down by adhesions either from duodenal or gastric ulcer, or gall-bladder infection, it fails to expand and the constricted area is distinctly shown radiographically. This procedure may be done purely for diagnostic purposes, or the air may then be removed from the rubber bag and the bag withdrawn until it reaches the area of constriction, and that portion of the duodenum bound down by adhesions may then be stretched by inflating the bag with air; this may be done under fluoroscopic examination. The same procedure is applicable to the pylorus. The advantage of this method is that all friction on the mucous membrane is avoided by not drawing the bag through the duodenum or pylorus while it is inflated with air.

The following modification of Einhorn's pyloric dilator is recommended as of great value. A second tube slightly larger than the first surrounds it and terminates just behind the rubber bag. Through this tube bismuth and buttermilk, or bismuth suspended in some other fluid may be injected or aspirated directly from the duodenum, and the exact amount of distention of the duodenum thus controlled.

Besides showing adhesions from duodenal and gastric ulcers, and gall-bladder infection, the head of the pancreas can be more perfectly outlined by the duodenum as suggested by Crane, and in some cases the canal of Wirsung may be distinctly shown.

Carman divides the roentgenological indications of duodenal ulcer into major and minor signs. His major signs are as follow: (1) Gastric hyperperistalsis; (2) a residue in the stomach (sometimes in the duodenum after six hours) if there be an obstruction from scar contraction; (3) a diverticulum of perforating ulcer. The minor signs include: (1) Gastric hypermotility with early free

opening of the pylorus and speedy clearance of the stomach; (2) gastric hypertonus; (3) irregularities in the outline of the cap or bulk, or of the duodenum; (4) lagging of bismuth in the duodenum; (5) pressure-tender point over the duodenum; (6) spasms of the stomach, such as hour-glass or slowly traveling incisura.

The technique by which these signs may be elicited is varied. One of the most satisfactory is the double meal method. While increased peristaltic action may sometimes promote an early evacuation of the stomach, there is no fixed relation between the two. Whenever the combined screen and plate method of examination is used, peristaltic exaggeration in duodenal ulcer is readily discoverable, occurs in a large proportion of cases, and has a high diagnostic value regardless of the time of gastric clearance.

The intensity of peristaltic vigor varies from a slight exaggeration of wave-depth to an almost tumultuous energy of contraction. So extreme is the latter in the constructive sense that the stomach is nearly segmented by the opposed waves and resembles a row of balls. The peristaltic contractions on the lesser curvature participate in the tempest. Normally traversing only a small portion of the lesser curvature and deepest in their termination, they now seem to cover a wider range and are deep throughout. This symmetry and correspondence of the contractions on both curvatures is a distinctive feature. The waves are increased not only in depth, but also to some extent in frequency, so that three or four pairs may be seen in progress at once, whereas normally, using the mediums mentioned, only one or two very superficial pairs are seen.

This exaggeration of gastric peristalsis does not seem to be related to hyperacidity, because it has been noted in many cases of ulcer with moderate or low acidity.

Stenotic lesions on the gastric side of the pylorus are rarely accompanied by gastric hyperstalsis. Even if the perstalsis be greater than normal it is not likely to be bilateral, but will show its activity chiefly on the greater curvature. Antiperistalsis in duodenal irritation, even with obstruction, had never been observed.

The exaggerated peristalsis which may be evoked by massage of the epigastrium differs from the hyperperistalsis of duodenal ulcer in the fact that the former subsides very quickly after manipulation ceases. The hyperperistalsis of duodenal ulcer requires no external stimulation to induce it. During and immediately after the ingestion of the bismuth water, peristalsis often seems rather marked, but this soon subsides. After filling the stomach with the bismuth pap, on the contrary, the institution of peristalsis is quite commonly delayed for some minutes, reaching its maximum vigor still later. The hyperperistalsis of duodenal ulcer is quite commonly of intermittent character. It may be noted on the screen but not seen on the plate, or vice versa. Hence, observation should be prolonged until this sign has had time to appear.

The degree of peristaltic vigor is apparently influenced by the character of the opaque meal. The commercial condensed milks, which contain butter-fat, markedly depress peristalsis. Fermented whole milk, buttermilk and potato starch pap are admirable mediums and do not adversely affect peristaltic action. Bismuth oxychloride is believed to produce more vigorous action than does the subcarbonate. This is also true of barium sulphate. It has also been observed that in plates made with the patient prone, the

peristaltic vigor is more pronounced than in plates made of the same patient when standing. For these reasons one should have a uniform technique, so that comparisons may be made on the same basis.

Of all the radiological signs of lesions of the digestive tract, the presence after six hours of a distinct residue from the barium of bismuth meal is perhaps the most important. The radiologist feels assured that almost without exception such a residue signifies an organic lesion, whether or not all his diagnostic deductions be confirmed. Theoretically, a residue may remain in simple atony as has been observed in one case (no operation).

A residue of the stomach from the barium or bismuth meal, six hours after its ingestion, occurs in a large proportion of cases of duodenal ulcer. This is often loosely spoken of as being due to pyloric obstruction, whereas the obstruction is actually in the duodenum and is produced by ulcer—scar contraction. Occasionally, there will be found not only a six-hour residue in the stomach, but also a six-hour residue in the duodenum above the stenosis, thus enhancing its diagnostic value. A six-hour residue in the duodenum may result from bands of adhesions, or from the pylorospasm incident to gall-bladder disease.

The diverticulum of perforating duodenal ulcer is rather decisively diagnostic when found, but its rarity is shown by the fact that in the 198 cases herein reported only 2 showed this phenomenon, both of which were diagnosed radiologically.

At the screen examination, the bismuth water, immediately after being swallowed, is often seen to flow freely and spontaneously into the duodenum, sometimes visualizing the latter throughout. When the flow is not spontaneous, slight pressure on the stomach, or pressure on the region of the appendix, may induce it. This relaxation of the pylorus is in such marked contrast to the resistance which it ordinarily offers to immediate evacuation of the stomach, and occurs so frequently in duodenal ulcer that numerous theories have been advanced as to the mechanism of its production. Unfortunately, this sign is by no means pathognomonic of duodenal ulcer; it is often seen in association with lesions of the gall-bladder, chronic appendicitis, dilated or lax duodeni, neurasthenia, and other conditions, including carcinoma of the stomach. The flow through the gaping carcinomatous pylorus is usually so voluminous and continuous, however, that the experienced observer will rarely confound it with that noted in duodenal ulcer.

Various degrees of gastric tone may be in association with duodenal ulcer. With long continued duodenal obstruction the stomach may become hypotonic or even atonic, through broken compensation. Such instances, however, are in the minority. More often an orthotonic or hypertonic stomach is found. He had seen the latter so frequently that he regards it as quite suggestive of duodenal ulcer, especially if the stomach be of the fish-hook form, and otherwise normal.

A hypertonic stomach alone, is, of course, not necessarily diagnostic, but in general it may be stated that in duodenal ulcer the tendency is toward hypertonicity.

Irregularities in the outline of the bulbus duodeni, where most ulcers occur, have received considerable exploitation as a reliable indication of duodenal ulcer, chiefly by those radiologists who have

depended upon plate findings rather than on screen examinations. The technique involves the making of a large number of plates in a given case, and to establish the diagnosis, every plate must show the same filling defect or deformity at a suspected point, a single plate showing a normal bulb being negative for ulcer.

Irregularities of the duodenal wall are by no means pathognomonic of ulcer or even of a duodenal lesion. Distortion by adhesions form a cholecystitis by pressure, or by incomplete filling is not at all uncommon, and deformity due merely to spasm is rather frequently seen. Further, as is observed in ulcers of the stomach, not all ulcers of the stomach, not all ulcers of the duodenum are sufficiently extensive to produce a local distortion that is radiologically demonstrable. The degree of distension of the bulb and duodenum and consequently the effectiveness of visualization of their outlines will depend in part on the ratio between the amount of bismuth flowing through the pylorus and the rate of duodenal evacuation. When the patient stands, the vertical bulbus, which commonly accompanies a fish-hook stomach, will retain better the bismuth by reason of gravity, while the horizontal bulbus of a steer-horn stomach will drain more rapidly.

As seen at operation, three types of ulcer may be distinguished. (1) Those in which the ulcer is evidently limited to the mucosa, and is not seen externally because of the absence of scar tissue. Its presence is determined by the surgeon by palpation and to a less extent by an area of hyperemia, or by petechiæ over the ulcer-bearing area after it has been rubbed with the palpating finger or with gauze. (2) Those with visible scar production but without marked contraction or deformity. (3) Callous ulcers with extensive cicatrization and accompanied often by stenosis.

Adhesions are rarely seen in the first type, occasionally in the second, and commonly in the third, especially if there is a perforation or an associated cholecystitis. In the first and second of the above-mentioned types, deformity is either absent or so slight as to make its radiological detection impossible. As a matter of fact, such ulcers occur in which no deformity was found either in the Roentgen-ray examination or at operation. In the third type the distortion may be radiologically evident, yet indistinguishable from that consequent on inflammatory lesions extraneous to the duodenum. In this type also stenosis may prevent effective filling of the duodenum with bismuth and thus render negative the diagnosis by this radiological sign.

The normal duodenum empties itself so rapidly that bismuth passing through it is with difficulty visualized on the screen and is rarely seen on the plate unless as an ill-defined faint shadow. In duodenal ulcer, on the other hand, the bismuth often lags in its progress through the duodenum, and shows distinctly on the screen and plate, as a well-outlined shadow. Sometimes the shadow is broken up into separate boluses with vacant areas between, or again it may be more or less continuous. Lagging of the bismuth in the duodenum, even though irregularly distributed, is by no means diagnostic of duodenal ulcer, since it is found quite often where the duodenum is normal, and other intra-abdominal lesions exist.

If the contention be true that localized tenderness to pressure of an abdominal viscus exists only when the parietal serosa is involved, then early duodenal ulcers are exempt from this sign. As a matter of fact, tenderness over the duodenal region is quite fre-

quently noted, but whether this tenderness is ascribed to ulcer or to a lesion of the adjacent gall-bladder depends largely on the bias of the observer toward the one or the other. The varying energy of the examiner's manipulation and the differing sensitiveness of patients are also uncertain factors.

During the ten months covering the period from March, 1913, to January, 1914, inclusive, Carman had made Roentgen-ray examinations of 2,723 persons for lesions of the digestive tract. Of these, 718 later came to operation and 198 were found to have duodenal ulcer.

A radiological diagnosis of duodenal ulcer was made in 135 of the 198 cases. In 19 a diagnosis was made of obstruction at or near the pylorus, without further attempt at diagnostic radiological grounds as duodenal ulcer, and were found at operation to have some other lesion. 29 were gall-bladder affections, 17 chronic appendicitis and 22 miscellaneous conditions.

Hyperperistalsis, of various degrees, was noted in 113 (57 per cent.) of the 198 cases of duodenal ulcer. Residue was observed in 72 (36.3 per cent.) of the duodenal ulcer cases. Hyperperistalsis in conjunction with a six-hour residue is worth more than 95 per cent. in diagnosis, and occurred in 49 (24.7 per cent.) of the 198 cases. This combination was seen in 3 or less than 1 per cent. of the 520 cases other than duodenal ulcer.

Six (3.7 per cent.) of 159 cases of lesions of the gall-bladder manifested increased peristalsis. These cases give the greatest difficulty in differentiation from duodenal ulcer.

Hyperperistalsis was shown in 11 (3 per cent.) of the 361 cases of lesions other than duodenal ulcer or gall-bladder.

The exaggerated peristalsis of duodenal ulcer does not appear to be related to the degree of hyperacidity. The average total acidity in 80 cases with hyperperistalsis was 69.7 per cent., while in 72 without hyperperistalsis the average total acidity was 74.8 per cent. The highest acidity noted, 120 per cent. occurred in a case with normal peristalsis.

Though the Roentgen ray often fails in the positive diagnosis of duodenal ulcer, its findings have an exclusion value. That is to say, the chance of some other lesion existing is minimized in proportion as the latter is radiologically determinable.

He concludes that the hypermotility, hypertonus, deformity of the cap or bulb, lagging of bismuth in the bulb, pressure-tender point over the duodenum, and spasm of the stomach are minor contributory radiological signs of duodenal ulcer. The combination of hyperperistalsis and six-hour residue or a diverticulum, when found in an otherwise normal stomach, constitute about the only evidence on which a purely radiological diagnosis of duodenal ulcer may safely be advanced.

Cole's criticisms of the above report question whether the signs described by Carman constitute a symptom-complex of duodenal ulcer. In the author's own words, they are 'signs' or symptoms, and not direct evidence of the lesion itself. He says radiological signs and symptom-complexes for duodenal ulcer are as numerous and varied as the observers who describe them.

The three 'major signs' are trifling compared with the direct evidence which Carman relegates to the third place under 'minor signs.'

Included in the title and at the head of the list of signs stands hyperperistalsis. Yet three or four roentgenograms illustrating the article fail to show more active peristalsis than is observed during the stage of systole in 50 per cent. of normal cases. Therefore as a cardinal point on which to base the roentgenological diagnosis of duodenal ulcer, hyperperistalsis is an unreliable cornerstone. The case which does demonstrate real hyperperistalsis presents sufficient pyloric obstruction to cause a six-hour gastric retention of three-quarters of the bismuth meal; but there is nothing in Carman's argument to indicate that the obstruction was caused by a duodenal ulcer rather than by some other organic obstruction. As a case of pyloric obstruction the diagnosis was perfectly obvious.

Residue in the stomach at six hours is frequently present in cases exhibiting no organic lesion of the stomach or duodenum, and *per se* of little significance.

The appearance illustrated and termed 'residue' in the duodenum may be seen during some stage of the gastric cycle in nearly all cases, especially when the patient is examined in the erect posture. It is similar to Hemmeter's sign, which has led to many erroneous diagnoses of gastric and duodenal ulcer.

In dealing with a 'diverticulum' of perforating ulcer, Carman's terminology is ambiguous. If he meant an accumulation in the punched-out crater of an ulcer, the finding is of great significance when present, but it is relatively rare. An accumulation in the uninvolved portion of the cap is also a noteworthy finding, but must be differentiated from the chyme in a normal cap at the end of gastric digestion.

The fallacy of depending upon the pressure-tender point, which is Holzkecht's chief diagnostic symptom, has been referred to by Carman previously. It is recalled that in a former communication he defined the locus of the tender point as 3 or 4 in. from the site of the ulcer.

Considering the method which Carman employs, his percentage of successful diagnoses is remarkable—namely, 135 out of 198. These statistics, however, hardly agreed with those of another member of the staff of St. Mary's Hospital, who remarked within a year that 85 per cent. of the Roentgen-ray reports offered no confirmation or disproof of a gastric or duodenal lesion. Moreover, according to Mayo, the Roentgen ray has given diagnostic aid in only 65 per cent. of their cases of gastric carcinoma. This would seem to leave much that might be attained by the use of serial roentgenography.

Childs states that ulcer of the first portion of the duodenum is more frequent than ulcer of the stomach, and it has only been within the past one or two years that the value of its diagnosis by the *x*-ray has been sufficiently recognized. While the author does not believe that certain characteristic *x*-ray appearances of the duodenum, ordinarily attributed to ulcer, are infallible, nevertheless, certain signs, when present, will demonstrate a definite lesion demanding surgical interference, whether this lesion be an ulcer of the duodenum, a chronic appendicitis, or adhesions associated with an infected gall-bladder.

In acute ulcer of the duodenum, the stomach contents are evacuated in much shorter time than normally, due to a relaxed pyloric sphincter, and varies from half an hour to two hours. When this

condition can be demonstrated, associated with a persistent non-filled bismuth area in the cap of the duodenum, there is sufficient ground for the diagnosis of acute duodenal ulcer, especially when the clinical symptoms are suggestive of such trouble. In the more chronic forms of duodenal ulcer, a persistent ragged appearance of the cap, and if the cicatricial contractions resulting from the ulcer are sufficient to produce stenosis, associated therewith, a delayed emptying of the stomach at the sixth hour period occurs.

Childs concludes that the appearance of ulcer of the duodenum may be simulated by adhesions from the gall-bladder or a chronic appendicitis; but certain changes in its position, shape and size are diagnostic, especially when associated with the characteristic clinical manifestations.

Leonard, in a report on the work of the Section of Radiography of the International Congress of London, 1913, says, regarding ulcers of the duodenum, that they vary in their character from simple ulcer to perforating. Their determination by clinical surgical methods, as by symptomatology and palpation, has been very different and the source of much discussion among surgeons—English and American surgeons holding that the typical symptom is the hunger pain. This has been explained as the result of the passage of hypersecretion from the stomach after it is empty of food, the renewal of food and normal digestion relieving the irritability of the ulcer. The diagnosis of duodenal ulcer is therefore of great importance, and the perfection of its roentgen diagnosis most important. It has been found possible, by the use of a watery suspension of bismuth, given on a fasting stomach, to fill the duodenum, and thus more readily observe its condition.

In superficial ulcer of the duodenum the emptying time of the stomach is normal or decreased, in contrast to the delayed emptying in cases of gastric or pyloric ulcer, which produces a spasm of the pylorus. The stomach generally has the hypertonic form, the pylorus and greater curvature lying above the umbilicus. The stomach is not dilated in its lower pole as in gastric or pyloric ulcer. The peristalsis of the sinus is more marked, and the pylorus opens more frequently. A point of tenderness upon pressure is located over the bulbous duodeni, and the patient, if asked to locate the point of pain, usually places the finger over this spot.

A number of cases have been reported in which gastric and duodenal ulcers have been found to coexist. Here a conflict of symptoms has been noted—the duodenal ulcer counteracting the spasm of the pylorus provoked by the gastric ulcer—resulting in a more rapid evacuation of the stomach than normal.

Penetrating ulcer of the duodenum is less frequent, and has in addition to the symptoms of superficial ulcer the characteristic diverticulum outside the normal shadow of the duodenum, which persists in a small bismuth fleck after the duodenum is empty.

A condition characteristic of all ulcers of the duodenum is the retention of the opaque chyme in it for a longer period than normal, as the result of a mild stenosis possibly, spasmodic at the duodeno-jejunal juncture. It is probable that many of the so-called Lane kinks situated at this juncture are in reality spasmodic stenoses due to duodenal ulcer rather than to actual kinks due to ptoses. This is more likely because of the defective mode of examining these patients, which errs in making the examination in the right

lateral position rather than in the upright, in which position in the nature of the kink it would be most marked and more easily observed. In addition, after the administration of the opaque meal, the patient was placed upon the right side, thus causing the filling of the duodenum and aiding the retention of the bismuth in that organ.

Spasms of the duodenum due to neuroses produce transient symptoms that are characteristic of ulcer or mild stenosis, but can be differentiated by their amenability to appropriate medical treatment.

Stenosis of the duodenum due to neuroses produce transient symptoms that are characterized by an abnormal repletion and the presence of visible peristalsis and antiperistalsis. The dilatation of the duodenum is greater the narrower the stenosis, and the extent involved longer according to the situation of the stenosis. The peristalsis is uninterrupted so long as the opaque chyme is retained. The character of the stenosis, whether it is spasmodic, cicatricial, due to pressure of bands from without, or the result of new growths, cannot in the majority of cases be determined by the Roentgen method.

The presence of strong cicatricial bands connecting the liver and gall-bladder with the duodenum have been frequently observed by surgeons in operation in this region of the abdomen.

It has been demonstrated that the presence of such adhesions involving the duodenum and the stomach can be demonstrated by the roentgen examination. The interference with motility and peristalsis can be observed upon the screen with the patient in the upright position, or may be shown in roentgenograms either in the erect position or when the patient lies upon the left side.

George and Gerber agree with Cole in method, technique and argument. They say the more they have accumulated evidence on this subject, the more they have become convinced that six-hour gastric stasis is the least important factor in roentgen bismuth diagnosis. The investigators who developed the idea of bismuth residue as a diagnostic factor always used the standard Rieder meal, consisting of 40 grm. bismuth salts in 300 c. cm. cooked cereal. The workers who have attempted to transfer these conclusions bodily to their own cases have used a variety of test-meals, ranging from 300 to 600 c. cm. and containing from 40 to 100 grm. bismuth or barium. As a basis they have also used water, plain milk, malted milk, buttermilk, mashed potato and a variety of other mixtures. It is quite obvious that conclusions based on thousands of cases carried out under a similar technique cannot be transferred without change to a dozen other methods of investigation. Briefly they epitomize their ideas about this subject in a few propositions, as follow:—

1. Ninety-five per cent. of all duodenal ulcers appear on the superior surface of the duodenum with the cicatrix extending either posteriorly or anteriorly or both, but rarely on the inferior surface.

2. Anatomically, the first portion of the duodenum is a constant entity; that is, in healthy, normal persons it will always present the same smooth regular appearance.

3. This normal condition can be demonstrated by bismuth in every normal person as a regular smooth bismuth shadow of a characteristic shape and outline, the so-called 'bishop's cap.' Fail-

ure to obtain this cap in a normal person is due either to improper technique or to improper bismuth mixtures.

4. If the normal duodenal cap can be demonstrated in every normal person, then the presence on plates of a constant defect in the cap means a real pathological condition. This again means the differentiation between medical and surgical cases. In no case of duodenal ulcer, apart from perforation or extreme hemorrhage, should operation be performed unless the bismuth examination shows a definite, constant deformity of the bishop's cap. The cases in which this warning was disregarded have mostly proved to be surgical failures.

5. Every duodenal ulcer which is more than a simple peptic erosion has a sufficiently deep cicatrix to deform the bismuth contour. The simple ulcers are clinically negligible in this connection, since every case which finally comes to the physician for help already has an abundant cicatrix.

6. In this connection the negative diagnosis is as valuable as the positive. Every patient in whom a normal duodenal cap can be demonstrated has no indurated or surgical ulcer of the first portion of the duodenum. Clinical methods alone, can make as positive a diagnosis of the presence or absence of indurated ulcer as the roentgen method can; the roentgenologist must be thoroughly trained and carry out the method that has been demonstrated by Cole to fulfil these requirements.

Articles on pylorospasm and gastric and duodenal ulcer are the last of a series of publications in which Kreuzfuchs deals with the motility of the stomach in gastric and duodenal ulcer. On the basis of supposed observations before the roentgen screen, he makes assertions which, according to the experience of Holz knecht and Haudek, are unwarranted. Giving new designations to these older data and findings, without crediting the authors thereof, he arrives at the far-reaching conclusion that gastric and duodenal ulcer may, in a very simple manner, be recognized and differentiated radiographically. This has not been borne out by the works of Holz knecht and Haudek. In the following, contending points arranged numerically are selected from the articles cited. Kreuzfuch's conclusions are as follow:—

1. If there is normal or increased acidity with a normal duodenum, and duodenal secretions, a reflex closing of the pylorus takes place after the passage of the ingesta into the duodenum. This closing manifests itself not only in the appearance of a bismuth-free space between antrum pylori and bulbus duodeni, but also—and that is the essential point—in a decline of the tonus of the corpus ventriculi and in an immediate or almost immediate ceasing of the movements of the stomach. This closing evidently continues as long as the acid is neutralized in the alkaline medium of the duodenum, whereupon the stomach again contracts and new undulations occur which effect a visible passage into the duodenum.

2. In gastric ulcer, soon after the filling of the stomach, a reflex closing of the pylorus takes place and is associated either with unpleasant sensations or with actual pains. The latter may be regarded as a sign of the resistance of the pylorus (pylorospasm). Under this expression is, therefore, understood a closing of the pylorus associated with cramp-like pains. As this clos-

ing of the pylorus takes place soon after the ingestion of the meal, it should be regarded as an immediate pylorospasm.

3. In duodenal affections a duodenal reflex, at the beginning of the digestive process, occurs either not at all or at great intervals, so that the stomach is greatly contracted while there is deep peristalsis of the corpus and the antrum and visible filling of duodenum and jejunum. During this stage the patients feel relieved, and in non-complicated cases at least, do not complain of pains. If, however, the patients are examined during the further course of digestion and at a time when pains have set in, remnants of food are found in the stomach and the picture of the reflex closing of the pylorus is observed. It is the so-called tardy pylorospasm which there dominates the scene.

4. With regard to normal stomachs, Kreuzfuchs is not able to confirm the view held until recently that the flow of hydrochloric acid into the stomach causes a reflex closing of the pylorus. His observations show that, in ulcerous processes in the stomach, a reflex, frequently painful closing of the pylorus takes place, while in duodenal affections there is observed the absolutely surprising phenomenon of increased peristalsis and actual acceleration of the evacuation of the stomach. From that he concludes that it seems as if the inflow of the hydrochloric acid caused a hypersecretion in duodenum and pancreas, which almost immediately counteracts any closing of the pylorus that may have prevailed.

5. In a recently published investigation, he attempted to make an exact diagnostic distinction, by methods of radiology, between two disease processes (*ulcus ventriculi* and *duodeni*) and he had always been able to make correct diagnoses, as proved by subsequent experiences based upon material obtained at operation or at autopsy (50 cases with 16 operations). He showed at that time that gastric ulcer may be clearly distinguished from duodenal ulcer by a physiological test before the roentgen screen. Immediate pylorospasm in gastric ulcer being present, tardy pylorospasm occurred in duodenal ulcer. Many cases presented an irregular reaction when subjected to the hydrochloric-acid test. In these cases it was found that the operation revealed a third and hitherto unknown factor, for in a case which presented duodenal motility, despite the fact that the findings of the clinical examination indicated gastric ulcer, and in another case in which the hydrochloric-acid test also pointed to duodenal ulcer while the *x-ray* examination revealed a niche in the lesser curvature, the diagnosis of gastric ulcer with involvement of the pancreas, basing this diagnosis upon the assumption that an impairment or modification of the function of the pancreas is essential to duodenal motility. As a matter of fact, it was found at the operations of the two cases that there were gastric ulcers which had penetrated into the pancreas.

He therefore takes the position that the cause of duodenal motility is to be sought in the ceasing degree of the function of the pancreas, and believes that there is found important and irrefutable proofs of this in the patients' histories. For it was noted upon scanning the histories of patients that in all cases in which the hydrochloric-acid test indicated gastric ulcer, the pancreas was found intact. In cases which presented duodenal motility there was regularly observable an affection of the pancreas. It seems, therefore, that the hydrochloric-acid test inaugurated by him is a

test for pancreas. As a further proof of this theory he noted that three cases of niches in the lesser curvature and six-hour remains, reported by Faulhaber, were ulcers which had penetrated into the pancreas.

In contention of Kreuzfuch's views, Holzknecht and Haudek bring forth the following arguments:—

1. The assertion that it is possible to observe reflex closing of the pylorus before the roentgen screen is not based upon facts. The 'bismuth-free' border between antrum pylori and bulbus duodeni proved neither opening nor closing of the pylorus; for it frequently happens where a bismuth-free pyloric slit is observed, that considerable quantities of contrast-contents pass through the same. Neither can they confirm the observation, by means of the screen, of a decline of the tonus of the corpus ventriculi decreasing the motility of the stomach when the acid content of the stomach passes into the duodenum. Numerous examinations of normal stomachs with various degrees of acidity yielded such a great variety of results with respect to tonus, peristalsis, and initial discharge that the opposite view does not appear justified by the facts.

2. According to the above, the 'reflex closing of the pylorus' can in no way be diagnosed radiologically; the premises for the further assertions are therefore at fault, and on the other hand pains may be altogether absent at the time of the roentgenological examination in unquestioned cases of florid gastric ulcers which are associated with demonstrable pylorospasm. The close linking of an objective symptom with one that is uncertain and purely subjective is, moreover, certainly open to question. The occurrence of retention of the bismuth-paste, from a slight to a considerable amount while stenosis of the pylorus is absent, was first demonstrated for ulcer ventriculi by Haudek and hypothetically traced to pylorospasm. The diagnosis of pylorospasm is based, therefore, upon the results of the motility test of the stomach and not upon a purely morphological condition; unfortunately this state of the case has in no respect been altered by Kreuzfuch's work. As in a case with a niche (in the lesser curvature) and retention of remnants after twenty-four hours, which was operated, they had shown in cases of ulcer of the lesser curvature that they could at all times drive bismuth from the stomach into the duodenum, in spite of the reduction of the total period of evacuation, which ought to be decided evidence against the presence of reflex closing of the pylorus.

3. With regard to duodenal ulcer, Haudek was the first to describe the patent pylorus as symptomatically valuable. In this description he followed the analogy of its description by Holzknecht, who had been the first to observe it in connection with duodenal stenosis and to compare it with the picture of duodenal incontinence. (The English author, Barclay, to whom priority must be conceded in the matter of the quick evacuation of the stomach in cases of duodenal ulcer, escaped Kreuzfuchs, as well as Holzknecht, who in 1911, had called attention to the rapid evacuation of the bismuth water as diagnostically differentiating duodenal ulcer from gastric ulcer.)

The frequent occurrence of six-hour residue, which was first noted by Haudek and referred by him to pylorospasm was associated with gastric ulcers. These two conditions, accelerated evacuation of the first portions and a slight retardation of the complete

evacuation, belong to-day to the acceptedly most important conditions in duodenal ulcer, without, however, being characteristic of the same. Possibly the designation 'tardy pylorospasm' may be justified as an hypothesis by the above conditions, but Kreuzfuchs' explanation of it by extremely variable and undependable sensations of pain and also by the 'reflex closing of the pylorus' is certainly to be rejected and is calculated only to obscure Haudek's claims to authorship. In the case of six-hour residue in duodenal ulcers, peristalsis ought, therefore, to be absent and the pylorus closed; but frequently the exact opposite is to be observed. That is, we observe normal peristalsis, bismuth being easily expelled from the stomach into the duodenum; the pylorus is therefore by no means reflexly closed.

4. That Kreuzfuchs is not able to observe a 'reflex closing of the pylorus,' following introduction of hydrochloric acid, is easily understood, as, according to the above, this is not possible radiologically in the manner indicated by Kreuzfuchs. It remains an actual riddle how Kreuzfuchs is able to see the process of a 'reflex closing of the pylorus' in gastric ulcer, inasmuch as according to Kreuzfuchs the pylorus is already closed by the immediate pylorospasm. In duodenal ulcer, where the stomach in itself is in an abnormally great state of contraction and the duodenum is filled by the gastric content with abnormal rapidity, peristalsis is increased after introduction of hydrochloric acid and evacuation actually increased. In the aforementioned case of ulcer of the lesser curvature with niche and twenty-four residue, the condition after the introduction of hydrochloric acid was in no way altered during several hours of observation. After, as well as before introduction of HCl, bismuth could readily be ejected from the hour-glass stomach into the duodenum; the same complete lack of effect on the part of the hydrochloric acid introduced was in every instance demonstrated in other cases of gastric ulcer. That is the exact opposite of what Kreuzfuchs asserts.

5. As results of the above-mentioned assertions—'immediate pylorospasm' in gastric ulcer and the contrasted outcome of the hydrochloric-acid test in the two cases—there is now presented an exact differential diagnosis which is claimed to be always successful. The fact that cases without retardation of evacuation, therefore without 'immediate pylorospasm,' do occur in gastric ulcer and that the hydrochloric-acid test likewise yields contradictory results does not, so far as Kreuzfuchs is concerned, in any manner affect the account; on the contrary, it is even made use of in substantiation of a further theory—namely, that 'duodenal motility' always occurs as a result of injury to the pancreas. That he thereby himself revokes the "certain differential diagnosis" between gastric and duodenal ulcer and that the name of 'duodenal' motility is now changed to 'pancreatic' motility seems to have escaped Kreuzfuchs.

Holzknicht and Haudek conclude from a review of their statistical material, based upon thousands of examinations and hundreds of operations, that they are by no means always able to differentiate between ulcer of the stomach and ulcer of the duodenum; and it does not seem justified to represent this differentiation as easy and certain. Excluding the well-known morphological syndrome of ulcer of the stomach and of the duodenum, which permit exact de-

termination of the location of the ulcer (such as niches, hour-glass contraction, stenosis, the Cole-George defect, etc.), they still retain those functional differences to which Haudek called attention as long as two and a half years ago, and which have now been given new names (Kreuzfuchs' contribution). Still there is no regularity in the occurrence of the motility picture; on the contrary, statistics demonstrate the following:—

(a) Pyloric ulcer almost without exception causes retention from the slightest extent to the highest.

(b) The pyloric ulcer (characterized, *e. g.*, by notching or incisura of the greater curvature) in at least 80 per cent. of the cases is associated with hypermotility to a slight or moderate degree. A noteworthy feature consists in the considerable variation of periods of evacuation; during successive days periods of evacuation below six hours may alternate with such of fifteen hours. In simple cases they have also observed accelerated evacuation of the first portions.

(c) Of the ulcers of the middle portions (*pars media*) 50 to 60 per cent. present a slight up to moderate six-hour residue; twenty-four evacuations have also been noted where the pylorus was found intact. In 30 to 40 per cent. of cases, evacuation is normal; in 10 per cent. plainly accelerated with respect to the first portions.

(d) In duodenal ulcer periods of evacuation are normal in 40 to 50 per cent. of the cases and generally accelerated in 30 to 40 per cent. of the cases. Of the 20 per cent. with six-hour residue in the stomach, about one-half in the beginning of the examination present permanent patency of the pylorus. Genuine hypermotilities seldom reach six-hour residue of a half bismuth meal.

With regard to the theory as to the effect of a disorder of the pancreas upon gastric motility, conditions which also contradict his theory are of frequent occurrence in their experience. Thus in the case of ulcerous niche with twenty-four hour retentions with open pylorus, the ulcer was not adherent to the pancreas, but had penetrated in a forward direction, while in a series of gastro-pancreatic ulcers, they had, on the other hand, observed large six-hour retentions.

The difficulties of the roentgenological demonstration of duodenal ulcer have led Haudek to call emphatic attention to these in an address delivered at the meeting of the Deutsche Gesellschaft fuer Chirurgie, and vigorously to oppose the publications which make assertions to the contrary; and a few weeks ago, Bier, who has closely studied duodenal ulcers, took the same position before the Berliner Gesellschaft fuer Chirurgie. For various reasons Holz knecht and Haudek now content themselves, and that without serious disadvantages, with making the diagnosis of *ulcus peripyloricum*, and do not try to distinguish between *ulcus postpyloricum* and *ulcus prepyloricum*.

George and Gerber, in a later publication, take the most radical stand upon positive diagnosis of duodenal ulcer by means of the Roentgen ray. Using the lateral position by the aid of serial radiography, they claim most emphatically that they are able to obtain positive objective defects in the duodenum in every ulcer which extends beyond the mucous membrane. They advance the following seven propositions in support of their views:—

1. The 'positive method' (to be considered less radical, they

use the words 'direct method') consists in demonstrating adequately the anatomical condition of the first portion of the duodenum. This is opposed to the conception of the symptom-complexes, which they state are only inferential in their evidence, and are not conclusive as compared with this method in which they actually try to demonstrate the lesion.

2. Ninety-five per cent. of duodenal ulcers occur in the first portion of the duodenum.

3. Anatomically, the first portion of the duodenum is a constant entity.

4. If normal, the first portion of the duodenum can always be demonstrated on a plate, with characteristic shape and smooth outline. There is no exception to this rule. Apparent exceptions are due to improper technique.

5. A constant defect in this duodenal cap means a pathological condition. This may be ulcer, adhesions, cholecystitis, or anatomical or accidental variations, such as pressure of adjacent organs, etc.

6. Any duodenal ulcer, which is more than a simple mucous membrane erosion, will deform the outline of the bismuth mass. To this statement there is no exception.

7. A normal bulbus duodeni or duodenal cap on the plates, rules out indurated or surgical duodenal ulcer.

SPLENECTOMY IN CERTAIN CHRONIC ANEMIAS.

A REVIEW OF RECENT LITERATURE.

By JEROME E. COOK, M. D., of the Editorial Staff.

1. Minkowski and Naunyn (*Arch. fuer exper. Path.*, Vol. XXI).
2. Chauffard (*Semaine Méd.*, 1908).
3. Widal (*Gaz. des Hôpitaux*, p. 1275, 1907).
4. Banti (*Folia Hemat.*, Vol. X, No. 1, 1910).
5. Banti (17 International Medical Congress; *Semaine Méd.*, p. 265, 1912; p. 313, 1913).
6. Pugliese (*Arch. per le Scienze Med.*, 1900).
7. Minkowski (Cong. fuer inn. Med., 1900).
8. Eppinger (*Wien. klin. Wochenschr.*, No. 23, 1913).
9. Eppinger (*Berl. klin. Wochenschr.*, Nos. 33, 34, 52, 1913).
10. Decastello (*Deutsch. med. Wochenschr.*, Nos. 13, 14, 1914).
11. Morse (*Berl. klin. Wochenschr.*, No. 45, 1913).
12. Hirschfeld (*Therap. der Gegenwart*, No. 9, 1913).
13. Huber (*Berl. klin. Wochenschr.*, No. 47, 1913).
14. Antonelli (*Policlinico*, April and May, 1913).
15. Kahn (Cong. fuer inn. Med., 1913).
16. Giffin (*Amer. Journ. Med. Sci.*, p. 781, 1913).

Despite the advances which have been made in the study of the physiology of the different organs and tissues of the body, the rôle which the spleen plays in the human economy remains almost entirely unknown. It is true that physiologists have agreed for some time that the spleen has something to do with the formed elements of the blood, but just what it does towards the production or destruction of these formed elements is far from being a settled question. Strangely enough, most of the knowledge which we have been able to gain in regard to spleen function has been as the result of observation of disease in the human, rather than by animal experimentation, although this latter method has added its share.

Splenectomy is by no means an operation of recent origin. We have long known that removal of the spleen was compatible with good health. Later we learned that certain slight changes in the blood, most notably a slight polycythemia and a change in the ratio of the lymphocytes and polymorphonuclear leucocytes, usually follow the operation. It was also observed by Pugliese some time ago that in splenectomized animals the amount of bile produced was greatly diminished. This observation has been confirmed by more recent investigators.

Of late, the spleen has attracted increasing attention on account of the part which it seems to play in certain diseases associated with anemia—namely, Banti's disease, hemolytic icterus, and so-called pernicious or primary anemia.

Banti some years ago called attention to a certain affection running a chronic course and characterized by anemia and a fibrous enlargement of the liver and spleen. A subicteric condition of the tissues usually accompanies the disease. In several of his cases splenectomy was performed with complete recovery. The disease is a rare one, but it is now well established as a clinical entity; and sufficient time has elapsed so that we know that the operation has brought about complete and lasting health. Even when there was a fairly well-advanced cirrhosis at the time of operation, the cirrhotic process made no further advance and the patients remained well. Others report similar results from splenectomy in this condition, in fact, from the literature at hand the operation is uniformly to be advised and a favorable outcome may be expected.

Related to Banti's disease is a condition, or perhaps a group of conditions, known as hemolytic icterus, which was first brought to our attention by Minkowski at the Congress fuer innere Medizin in 1900. Minkowski reported an affection which involved eight members of three generations in a certain family including a father and two children whom he was able to follow more closely. The father had a light icterus, a large, hard spleen, an apparently normal liver and much urobilin but no bilirubin in the urine. The children, who were twelve and seven years respectively at the time of the first examination, were otherwise healthy. Jaundice had been noticed in both shortly after birth. Another member of the family, who had been similarly affected all his life, died at seventy, and another was still living at eighty. The father of the two children died of an intercurrent pneumonia, and an autopsy was obtained. The liver showed no tendency to cirrhotic change; the spleen showed a diffuse hypertrophy without degeneration or fibrous change. All the affected members of the family had large spleens. They paid no attention to their affection, since it caused them no trouble nor did it seem to influence their term of life. Minkowski's report was followed by similar ones from other observers, most of which showed the same characteristics as those described by Minkowski—*anemia, early chronic jaundice, splenomegaly, and a family history.* Some of the cases, however, failed to show a family history of the affection, and in these the disease developed later in life and seemed to run a more severe course. Whether a further subdivision of this last type or even of the so-called family type of hemolytic icterus is advisable or warranted is as yet impossible to determine. The case reports are too few and too incomplete.

It is not at all astonishing that the spleen should be looked upon as the cardinal etiological factor in the causation of these conditions. The spleen is always enlarged, and when an accurate history can be obtained, as in 14 of the 18 cases reported by Giffin, the splenic enlargement uniformly precedes the development of the other symptoms. There seems to be no report of a case in which the opposite is definitely true. The benefit following splenectomy lends weight to the theory that the causative factor lies in the spleen. In fact it is difficult to harmonize the various findings without holding this organ responsible. But how the spleen brings about those other changes and which of its functions are in abeyance or, what is more probable, overactive is a question distinctly more difficult to answer. Several of the associated phenomena, such as the jaundice, the anemia, the urobilinuria and the histological changes in the

enlarged spleen have attracted particularly the attention of the investigators, and it might be well to review briefly some of their observations on these points. Ever since the theory of the mechanism of the so-called hematogenous jaundice, as expounded by Quincke and Gubler, was found untenable, attempts have been made to find a more satisfactory explanation for this type of jaundice associated with blood-cell destruction and anemia. Stadelmann, Joannovics and others have found that the secretion of bilirubin, the hematin derivative, as measured either directly or indirectly by the amount of urobilin in the stool, is greatly increased in hemolytic processes produced in animals. The increased viscosity of the bile, incident to this higher bilirubin content, causes it to flow with difficulty through the bile passages, resulting in a relative biliary obstruction with consequent jaundice. It will thus be seen that the viscosity of the bile, or the quantitative estimation of the bile pigments, or in a less accurate way the intensity of the icterus may be used as an indicator of the intensity of the hemolysis. Now when this test is applied in animals, with and without spleens, it is found, as has been mentioned before, that the splenectomized animals secrete much less bile than the normal animals. And upon administration of hemolytic agents, such as sapotoxin and toluylenediamine, it is found much more difficult to produce a hemolytic icterus in the splenectomized than in the normal animals.

This brings us to our second point—namely, the cause of the anemia. If one may place any reliance upon the results of the experiments just recounted, the anemia in these cases is due, not to a faulty blood production, but to an increased destruction as evidenced by the jaundice. And the benefit, which in the experience of the clinic has followed the operation of splenectomy, corresponds with the laboratory evidence that the presence of the spleen facilitates if it does not cause hemolysis. This hemolytic action of the spleen does not manifest itself in pathological conditions alone, but it is in a lesser degree one of the normal functions of that organ. Destruction of the red cells is constantly taking place; the hematin of these cells is the source of the normal supply of bile pigment. Banti holds that the spleen is not the only organ of hemolysis, but that it is the most active and most sensitive. The frequent occurrence of polycythemia after splenectomy is another argument for its hemolytic action.

An interesting series of observations first instituted by Widal and Chauffard and repeated by many others has to do with the resistance to hemolysis offered by the red blood cells under various conditions. The problem is really a double one and it seems improper to confuse its two parts: first the varying resistance of the red blood cells to hemolytic agents in the serum; second, the varying resistance of the red blood cells to differences in osmotic pressure—the washed cells being tested against graded strengths of hypotonic sodium chloride solution.

Widal found the osmotic resistance to be diminished in cases of hemolytic icterus of the hereditary type, but their sera was not hemolytic. Kahn made similar observations in a family with the same type of the disease. In 3 cases of the non-hereditary type, however, the diminished osmotic resistance was not demonstrable. Banti was likewise unable to demonstrate diminished resistance in cases of Banti's disease. In this respect then it would seem that

the 'acquired' type of hemolytic icterus and Banti's disease stood in close relationship; in fact, Banti suggests that they may be varieties of the same process. He refers to two cases of the 'acquired' type that died of anemia after four and six years respectively, neither of which showed any sign of cirrhosis of the liver. In one case that came to autopsy the spleen showed the identical picture of Banti's disease. Banti suggests that it was an early case of his disease in which the hemolytic poison was present in overwhelming amount with little of the poison which causes the cirrhotic changes. This is by no means improbable, for in all of Banti's cases the splenomegaly preceded the cirrhosis, sometimes by many years.

There is little wonder that, following the good results obtained by splenectomy in the aforementioned diseases, the same procedure should be advanced in the treatment of pernicious anemia. Here is a condition with all the signs of increased hemolysis including the subicteric conditions of the tissues. Eppinger, Decastello, Klemperer and Hirschfeld, Mosse and Huber have performed the operation for this condition. Reports of about a dozen cases are at hand. Mosse alone speaks of apparent cure; the others claim distinct benefit, but the blood still showed the characteristic picture, though not in extreme form. Eppinger has attempted to build up a theory based on the histology of the spleen in this condition as set forth by Weidenreich. He would make the spleen mainly responsible for the anemia. As Decastello points out, there is little ground to support this idea. Attempts to demonstrate a hemolytic substance in the spleen have been unsuccessful. The spleen of pernicious anemia shows no pathognomonic change, nor does splenectomy cure pernicious anemia which it might justly be expected to do were the spleen the seat of the disease. It seems to Decastello that the bone-marrow must still be looked upon as the prime etiological factor, and the benefit from splenectomy may be looked upon in the same light as the benefit from blood transfusion, *i. e.*, a direct stimulation to the bone-marrow.

In truth, we have no satisfactory explanation of the disease. Interesting and ingenious as are the various theories, not one answers all the necessary requirements so as to be convincing. But now that our attention has been so forcibly directed to the rôle which the spleen plays in some of these affections, it is to be hoped that continued investigation will lead us to a clearer view and a more fruitful therapy in the treatment of pernicious anemia.

GALL-STONE RECURRENCES.

A REVIEW OF THE LITERATURE.

By EMIL C. ROBITSHEK, M. D., of Minneapolis,
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1. Richardson (*St. Paul Med. Journ.*, February, 1912).
2. Shott (*Journ. Amer. Med. Assoc.*, p. 884, September 13th, 1913).
3. Aschoff (Choyce's "System of Surgery," Vol. II, p. 759).
4. Riedel (Quoted by Kehr in *Muench. med. Wochenschr.*, Nos. 46 and 47, 1911).
5. Lawson Tait (*Edinburgh Med. Journ.*, Vol. 35).
6. Poore (*Surg. Gynec. and Obstet.*, Vol. 15, p. 634).
7. Long (Quoted in Rolleston's "Diseases of Liver, Gall-Bladder and Bile-ducts").
8. Morrison (*British Med. Journ.*, Vol. 2, p. 1312, 1894).
9. Deaver (*Surg., Gynec. and Obstet.*, December, 1913).
10. Kehr: Technik der Gallenstein Operation.
11. Homans (*Annals of Surg.*, Vol. 26, p. 114).
12. Mignot (*Thèse de Paris*, 1897 and *Archiv. général de Méd.*, August, 1898).
13. Davis (*Surg., Gynec. and Obstet.*, Vol. 15, 1912).
14. McWilliams (*New York Med. Journ.*, p. 170, June 9th, 1906).
15. Munro (Quoted in Keary's "Medical Treatment of Gall-Stones," p. 96).
16. Keary (*Boston Med. and Surg. Journ.*, Vol. 148, p. 545).
17. Mayo (*Boston Med. and Surg. Journ.*, p. 359, 1905).
18. Herman (*Mitteil. aus den Grenzgebiet. der Med. und Chir.*, Bd. LV, p. 231).
19. Naunyn (*Deutsch. med. Wochenschr.*, No. 44, 1911).
20. Koerte (*Beitrage fuer Chir. des Gallenweges*).
21. Bakes (*Muench. med. Wochenschr.*, No. 41, p. 2162, October 23rd, 1902).
22. Andrews (*Annals of Surg.*, Vol. 36, p. 150).
23. Poppert (*Muench. med. Wochenschr.*, No. 40, October 6th, 1908).

The actual recurrence of gall-stones, or their reformation, following a complete removal of the same, by a previous, thorough, surgical operation, constitutes one of the rarities of surgery. Furthermore, the question, according to the late lamented Richardson, has never received the attention it deserves; as such, the writer deems it of sufficient importance to review the literature briefly.

There was a time, not a great many years ago, when the consensus of opinion of surgeons, of the largest experience along the lines

of biliary tract surgery, was that such recurrence did not take place. However, among these selfsame men, this opinion has changed, and that which they formerly ridiculed and denied, they now readily admit to be a fact. Others there are who still remain sceptical, and too, a very few who even deny this. This difference of opinion has always and naturally will perhaps exist, for who can say with certainty that stones found at the second operation were not those or a portion of those left knowingly, or unknowingly, at the first. That this is not uncommonly the case is shown by Kehr, who in analyzing his cases places the percentage of overlooked gall-stones at 4 per cent. Shott places the average as high as 10 per cent.

To understand recurrences of gall-stones, one should of course understand how and where they are formed. We are all fairly well convinced that gall-stones are caused by an infection and stagnation of the bile. According to Aschoff the single cholesterin stones, free from bacteria, are due to a stagnation of bile; if to a stagnant gall-bladder an infection is added, cholecystitis with the formation of more stones, usually pigmented line, results.

Undoubtedly most gall-stones are formed in the gall-bladder, where such a stagnation may most readily take place, although it is admitted that stones may also form occasionally in the gall-ducts. Riedel believes that gall-stones do not have time to form in the bile-ducts. Lawson Tait says that while it has generally been believed that gall-stones are formed in the gall-bladder, he does not think this is more true than of urinary calculi found in the urinary bladder. He believes that the gall-stones are formed in the streams of bile as they flow through the substance of the liver.

We are also aware that gall-stones are formed occasionally in the liver, the so-called intrahepatic stones. Poore in 80 autopsies found 8 intrahepatic stones. Long believes that intrahepatic stones, occupying the hepatic ducts and distending them, are very rare. Morrison thinks that stones are never formed, though sometimes found, in the smaller ducts. Gerster questions whether all gall-stones are formed in the gall-bladder, though he thinks most of them are. He admits the possibility of calculi forming in the hepatic and common ducts. Cases of recurrence may be accounted for, as having their origin in the deposit of cholesterin in Luschka's ducts. Deaver also calls attention to this class of cases, in which small gall-stones or particles of cholesterin lie embedded in the mucosa of the gall-bladder, the so-called Moynihan or also the MacCarty 'strawberry gall-bladder,' as a source of gall-stones.

Kehr believes that true recurrences occupy a subordinate or minor position in surgery, and are generally the result of over-conservatism on the part of the operator. It is indeed very interesting to follow Kehr from his earlier opinions of recurrences when he ridicules the idea, claiming such were due to the eating of sauerkraut, errors of diet and hygiene, up to the present, when he now admits of a true recurrence, following even a complete removal of the gall-bladder. He would divide recurrence into three classes: First, those in which an actual recurrence of gall-stones, following a complete and thorough removal of the same from the gall-bladder, cystic, common and hepatic ducts, takes place; secondly, false recurrences, or those due to stones left in the gall-bladder or ducts, or to adhesions, fistulæ, strictures and herniæ; and thirdly, those due to

remnants of gauze or thread, usually silk, the so-called incrustation recurrence, of which he himself has seen 6 cases.

Homans relates his experience in a gall-bladder case entirely emptied of gall-stones in April, 1895. On reopening the gall-bladder in January, 1897, he found 7 stones. Two were about the size of lima beans of yellowish color, attached in dumb-bell fashion to a piece of silk thread, three others attached to one piece of silk, two others, smaller and independent. His conclusion from this case was that it requires but a few months for the formation of gall-stones, in which time they may become quite large. This also, is in accordance with the ideas of Mignot, who from his experimental research believed it took only five or six months to form stratified well-formed biliary calculi. He further claimed that it was necessary for this that there be a comparative stagnation of bile, otherwise the soft immature calculi all might be of the same age, and due to one and the same attack of cholecystitis, which he believes to be a transitory event. If, he adds, a recurrent attack takes place in a damaged gall-bladder, fresh calculi may be found. Davis only once found stones to recur after a cholecystostomy. He found three chronic catgut sutures in a gall-bladder, having apparently been used as a purse-string suture. Each one was studded like beads. He thinks that the reason stones are not likely to form again, is that a definite infection is necessary to produce them. Kehr reports a case where fresh calculi were found around sutures introduced in the walls of the gall-bladder during an operation for removal of gall-stones. In a great majority of cases operated upon for gall-stones we may expect, according to McWilliams, a considerable discomfort for six months due to adhesions about the operation area, as well as more or less persistent gastric, intercostal and nervous symptoms. He noticed one case of recurrence out of 64 patients operated upon. The primary operation revealed four stones, and the second operation three years and eight months later a great many more.

Deaver reports a case in which at the first operation he removed 120 gall-stones, and two years later at a second operation 200 more. Munro reports a case of recurrence eight months after an operation. He believes gall-stones may form anew in the gall-bladder, but that this is extremely rare. Riedel, in twelve years of gall-bladder surgery, saw only one case of recurrence. Formerly he too believed that gall-stones did not recur, because draining the gall-bladder removed the infection. Keary, in a plea for the medical treatment of gall-stones, states unhesitatingly that gall-stones recur after operations for their removal. In 1887 Mayo quoted Kehr, Robson and others with large experiences in gall-stone surgery, as being of one opinion in declaring that they have not known of actual cases of gall-stone recurrence, and that this too had been his experience. However, in Volume VI of Keen's "Surgery," he also says "the danger of reformation of gall-stones after cholecystostomy is extremely small," and in his series he has seen 3 cases in which stones have reformed in the gall-bladder. In a personal communication from him on this subject, Mayo writes that in the experiences of their clinic, gall-stones have been found to recur, following cholecystostomy, one out of 800 or 1,000 cases. Deaver quotes Mayo as having observed 5 cases in which there was every reason to believe that stones had reformed in the common duct.

Lichternstern believes recurrence must be very rare. Herman saw 15 cases in Carlsbad that came there convalescing or following operation, and of these 7 had recurrences. Naunyn thought stones might recur. Koerte reported 7 cases of recurrence, and also one case of recurrence after the removal of the gall-bladder and drainage of the hepatic duct. Another case, where a similar recurrence followed a removal of the gall-bladder and hepatic-duct drainage, is reported by Bakes. Richardson, though he had never seen an actual case of recurrence, thought it was possible. Andrews thought he now believed less in stone reformation than formerly. Poppert, in an experience of 1,228 cases, had never seen a case of actual reformation of the gall-stones. Also Czerny up to this time claims never to have witnessed a case. According to Turner the percentage of recurrence in simple cases is small, between 2 and 3 per cent., and he emphasizes that it is important to recognize that recurrences take place after a complete removal of the gall-bladder. Personally, the writer has seen only one case. Here 150 gall-stones were found in the second operation, a year following the primary cholecystostomy.

The writer is convinced that gall-stones, even in the hands of the most skilful surgeons, and under the most thorough and complete operations, may recur, or reform, but he is also convinced that such a recurrence is a rarity, and a condition that should never deter us from advising a surgical operation for gall-stones. In fact, the writer is a believer in, and advocates an early operation in appropriate cases the same as for appendicitis.

The writer believes the earlier the stones are removed, the better will be the after results, and less tendency for a recurrence. As a second essential for prophylaxis, he would suggest a thorough drainage of the gall-bladder in all cases of cholecystostomy. The removal of the gall-bladder in all cases of gall-stones seems radical at this time, though the tendency of present day surgery points in that direction. Deaver says we must admit the possibility of recurrence of gall-stones after operation, a chance, the danger of which is greatly diminished by the removal of the gall-bladder. Bechy believes cholecystectomy the only sure cure for gall-stones, and says no functional results follow the removal of the gall-bladder. He says further that he believes after cholecystostomy, recurrences are frequent, and further operations are made difficult by adhesions formed about the gall-bladder.

Gerster believes that the presence of many stones, even though the cystic duct be patulous, indicates a removal of the gall-bladder, and comes to the conclusion that every dilated common duct should be opened, drained, and palpation of it follow, and not precede its incision. As a further aid to prophylaxis of recurrence, the writer agrees with Gerster that hepatic infection be guarded against and all causes of stagnation removed. Last but not least important, attention to diet, exercise and hygiene must not be neglected in the avoidance of recurrence of gall-stones, nor should we ever lose sight of the fact that gall-stones are not the cause but merely the results of a pathological condition; and, with this in view, our surgical treatment accordingly should always be most painstaking and thorough in our efforts to avoid a recurrence of gall-stones.

FUNCTIONAL TESTS OF CARDIAC EFFICIENCY.

By M. G. SEELIG, M. D., of the Editorial Staff.

1. Albrecht: Die Atmungsreaction des Herzens. Jena. 1910.
2. Biron: Concerning the Clinical Consideration of Several Methods for the Examination of the Functional Activity of the Heart. (*Wien. klin. Wochenschr.*, No. 35, 1909.)
3. Cecconi (Abs. *Zentralbl. fuer Herzkrankh.*, p. 310, 1912).
4. Christ: Concerning the Influence of the Muscular Action on the Activity of the Heart. (*Arch. fuer klin. Med.*, Bd. 53, p. 123.)
5. Fantus and Stæhelin: The State of Blood-Pressure During Muscular Work. (*Zeitschr. fuer klin. Med.*, Bd. 70.)
6. Geigel: Pulse-Rate in the Erect and Supine Postures. (*Deutsch. Arch. fuer klin. Med.*, Bd. 99, p. 26.)
7. Graupner: The Mechanical Examination and Value of the Heart's Action. (*Berl. klin. Wochenschr.*, No. 174.)
8. Guy: On the Effects Produced Upon the Pulse by Change of Posture. (*Guy's Hosp. Reports*, Vol. III, p. 92, 1838.)
9. Henderson: The Time that the Breath Can be Held as an Index for Acidosis. (*Journ. Amer. Med. Assoc.*, Vol. LXIII, No. 4, p. 318, 1914.)
10. Herz: Functional Examination in Heart Disease. (*Deutsch. med. Wochenschr.*, No. 6, 1905.)
11. Hofmann: Concerning the Functional Examination of the Heart. (*Arch. fuer klin. Chir.*, Bd. 104.)
12. Katzenstein: Ligation of the Aorta, etc. (*Arch. fuer klin. Chir.*, Bd. 76; *Zeitschr. fuer klin. Chir.*, Bd. 77.)
13. Koranyi: Examination of the Osmotic Pressure. (*Zeitschr. fuer klin. Med.*, Bd. 33.)
14. Korczynski: As to Simple Functional Examination of the Heart. (Quoted by Hofmann.)
15. Masing: Concerning the State of the Blood-Pressure in the Young and Old During Muscular Activity. (*Arch. fuer klin. Med.*, Bd. 74, p. 253.)
16. Maximowitsch and Rieder: Muscular Activity Conditional Upon the Fluctuating Blood-Pressure. (*Arch. fuer klin. Med.*, Bd. 46.)
17. Mendelsohn: Recovery as an Indication of Cardiac Function. (Quoted by Hofmann.)
18. Mosler: Respiratory Stasis, etc. (*Zeitschr. fuer klin. Med.*, Bd. 133.)
19. Schapiro: Concerning the Influence of the Fluctuating Blood-Pressure on the Function of the Heart. (*Wien. klin. Wochenschr.*, No. 35, 1909; Quoted by Biron.)
20. Stange (*Russk. Vrasch*, Vol. XIII, p. 72, 1914; Abs. *Journ. Amer. Med. Assoc.*, p. 1132, April 4th, 1914.)
21. Tornai: Contribution on the Functional Examination of the Heart. (*Zeitschr. fuer klin. Med.*, Bd. 70.)

The operating surgeon is always vitally concerned with the integrity of function of the respiratory, renal and cardiovascular systems, because an aberration of function in any of the organs composing these three systems may spell serious post-operative disaster. Indeed, we may safely generalize by saying that the most frequent contraindications to surgical intervention find their origin in renal, respiratory or cardiovascular disease.

As regards renal function, it is a well-known fact that for some ten or twelve years past, ever since Koranyi's work on the estimation of the freezing point of blood and urine, workers have been active in many quarters, on the problem of determining renal efficiency. As a result of all this work, we have reached a stage where we may, with proper qualification and reservation, safeguard our patient's welfare in so far as it is predicated upon our knowledge of renal efficiency.

Almost as much as this may be said regarding pulmonary function. The science of physical diagnosis is so perfect that we may fairly well judge in advance how much of a burden, in the way of anesthesia and operative shock, the lungs will stand. Of course, we have in mind no such mathematical accuracy as would enable us to foretell such accidents as post-operative pulmonary embolism or infarction; yet withal, we can usually, with a fair degree of comfort, estimate the reserve power of the respiratory system.

As much as this may by no means be said for the cardiovascular system. Auscultation of the heart, the determination of pulse characteristics and an estimation of blood-pressure are more or less useful guides, but after all has been said and done, both the surgeon and the internist almost invariably manifest very evident signs of doubt when confronted with the necessity of prophesying how a compromised heart will react to the unusual strain incident to surgical operative procedures. Much of this doubt is due to the fact that the surgeon, in his day's work, is so seldom brought face to face with the problem of cardiac efficiency, and that the internist, in his turn, is not so situated as to study intensively the effects of post-operative heart strain. No small amount of interest may be found in tracing the work that has been done up to now, in the direction of aiding both internist and surgeon to estimate properly cardiac function.

The earliest work along the line of testing heart function was done in England during the middle of the eighteenth century, and was based upon the varying rate of the pulse in varying postures of the body. For example, Guy, in 1838, showed that the average heart-rate in the standing position was 78, in the sitting position 68, and in the supine position 64. The variation in rate was supposed to be due to muscle contraction. In 1881 Schapiro confirmed the conclusions of Guy, as a result of extensive examinations on soldiers. In later years the estimation of blood-pressure was added to that of pulse-rate, and it was found, for instance, by Cecconi, that the pressure is lowest in the upright posture and highest when the individual is supine. Geigel emphasizes the fact that the pulse-rate difference varies in different individuals, and he lays down the very important principle that when the heart is compromised by disease, the pulse-rate is more rapid in the lying than in the erect posture. Although the method of estimating pulse-rate in varying postures still serves as a fairly useful means of testing cardiac efficiency, it has been supplanted largely by other methods.

Most of these other methods rest upon the principle of subjecting the heart to a definite amount of strain by means of measurable muscular exercise, and then determining the consequent alteration in pulse-rate and blood-pressure. Graupner, Christ, Korczynski, Masing and Hertz have all published methods that vary in detail of execution but are alike in that they all rest upon the fundamental principle of graded muscular work. Tornai in his publication, which follows lines similar to those laid down by the authors already mentioned, lays stress on the importance of practising the well-known auscultatory method of Korotkow in determining systolic and diastolic blood-pressure. Mendelsohn believes that the important thing in testing heart function is the determination of how rapidly the heart recovers after being subjected to muscular strain. Koranyi suggests that by estimating the freezing point of the urine, after muscle work, valuable data may be secured regarding heart function.

As regards the influence of muscle work on blood-pressure, opinions vary. Fantus and Staehelin report practically negative results. Maximowitsch and Rieder, on the other hand, report that when the heart is normal, muscle exercise always causes a rise of blood-pressure during the first five minutes, but that within twenty to twenty-five minutes the pressure falls to normal. All methods of determining cardiac efficiency, which rest upon the principle of muscle work, are, of course, poorly adapted to use at the bedside. For this reason, all the data which have been collected on this phase of the subject of cardiac function are rather of academic than of practical clinical value.

There has been developed, however, a set of tests, which may be used not only as criteria of cardiac function but also which may be used with impunity at the sick-bed. These tests depend upon determining the reaction of the myocardium to various reflexes. Kraus, for example, has suggested the use of the Hering-Kratschmer reflex, which consists in stimulating the endings of the fifth nerve by having the patient smell chloroform or ammonia. As a result of such stimulation, the blood-pressure rises, and the pulse-rate remains fairly constant, with a normal heart. Under this head, Etienne mentions, as a good test of cardiac function, the determination, by percussion, of the size of the heart, after tapping, rubbing, or otherwise stimulating the precordium. A normal heart diminishes in size after such precordial stimulation.

Another group of tests has been formulated upon the principle of testing cardiac function by interposing some obstacle in the path of the circulation. Biron was the first author to emphasize this method. He restates at length the earlier work of Schapiro, who compressed both femoral arteries, and noted the resultant effect upon the pulse. Schapiro reported that in individuals with normal hearts, the pulse-rate was not influenced by compressing both femoral arteries, but in individuals in whom the heart was diseased, the pulse-rate rose during the period of compression. This work of Schapiro was for some unaccountable reason lost to view for a period of twenty years, nothing being heard of it until it was re-emphasized by Katzenstein.

Katzenstein's original work had to do with collateral circulation, during the course of which work he studied the influence of ligation of the abdominal aorta on the heart and blood-pressure, and found that ligation of the abdominal aorta was followed by in-

creased blood-pressure, the increase being maintained until a collateral circulation was established. Katzenstein did not content himself with animal experimentation, but applied the principle of arterial closure to his patients. He compressed both femoral arteries, and studied the effect on the heart. The exact method of procedure, as described by Hofmann, from whose excellent résumé most of the data for this collective abstract are drawn, is as follows: The patient is placed in the supine position, and a blood-pressure estimate is made with Gaertner's tonometer. Both femorals are then completely compressed, just where they emerge under Poupart's ligament. Compression is maintained for two and a half minutes. If the heart is normal, the blood-pressure will rise, and the pulse-rate remain normal or become slower. If the heart is not in perfect shape, the blood-pressure will not be influenced or it will fall, and if the heart is seriously involved, the pressure falls and the pulse-rate becomes more rapid.

Albrecht has recommended a modification of Katzenstein's method, which he calls *Atmungspruefung des Herzen*. The patient is instructed to take and hold a deep inspiration, and the effect on pulse-rate and pressure is noted. As a result of the deep inspiration, the intrathoracic pressure falls, the large veins dilate, and a good deal of blood is withdrawn from the periphery. As a result, first the right heart and then the left heart is subjected to increased strain. Mosler, who has slightly modified Albrecht's method, states that a normal heart meets the added strain without an accompanying rise of pressure; if the heart is hypertrophied, the blood-pressure rises; with a functionally inefficient heart there is an accompanying fall in pressure; and in certain border-line cases the pressure rises at first, and then falls.

Hofmann has subjected the method of Katzenstein to the most extensive trial, and his contribution to the subject is particularly valuable because, although he is enthusiastic, he is nevertheless judicial to the extent of furnishing us the evidence of those men who see little of value in the method. He quotes Mendel, Janowski, Hooke, Staehelin as vigorous opponents of the method. On the other hand, Levy, Rudinger, Fellner, Ortner, and Biron are quoted as having confirmed all the claims made by Katzenstein. Hofmann classes himself with that group of men who have found Katzenstein's method of great aid in determining cardiac efficiency. He believes that those investigators who have failed to secure results identical with those of Katzenstein have not carried out the technique of the examination in all its details. It is very important, for example, that the examination should be so conducted that the patient is not in any way disturbed psychically. It is important, furthermore, says Hofmann, that the Gaertner tonometer should be used in determining blood-pressure. It is important that the femoral arteries should be compressed digitally and not by an Es-march tourniquet, and finally it is important that the patient should breathe freely and easily, without in any way centering his attention on his breathing. Hofmann also calls attention to the necessity of estimating the pulse-rate and the blood-pressure several times before the femoral arteries are compressed, so as to arrive at an average, and thus avoid the pitfall of any sudden variation.

In commenting on the value of Katzenstein's method, Hofmann lays most stress upon the fact that it furnishes a direct measure of the efficiency and strength of the heart muscle. He admits that an

experienced diagnostician is able to orient himself fairly accurately regarding the condition of the heart muscle, by interpreting properly the heart sounds; but even so, he says, there are many cases where we cannot rely upon auscultation to guide us in judging how a heart will stand the extra strain of narcosis and operative procedures. Hofmann has practised the Katzenstein method on his patients for years, and he has been guided by his findings, both as to the anesthetic to be used and as to the extent of operative procedure permissible. He furnishes a long tabulated list of data, and draws the following conclusions:—

1. A functional examination of the heart must be made invariably, before every major operation.

2. The advantages of Katzenstein's method lie in its physiological foundation and simplicity, and in the fact that it can be practised on bedridden patients.

3. The method enables us to select our anesthetic and to determine the extent of our operative procedure.

4. The results must be carefully interpreted in those instances where the patient is easily excited; but this difficulty is, in part, overcome by making several examinations.

5. The examination should always be repeated several times before any extensive operation is undertaken.

6. The examination itself does not in any way harm the patient; but, if, by any chance, a very sick patient should show signs of syncope, the compression on the femoral should be discontinued at once.

Very recently, Stange has suggested another method of testing cardiac function. He confirms the generally accepted doctrine that patients with mitral lesions stand narcosis and operation well, as a rule, whereas those with aortic and myocardial lesions are much poorer risks. Stange believes that neither the degree of blood-pressure nor the size of the heart is of much practical significance in judging cardiac efficiency. According to his notion and experience, the most useful test is a respiratory one. He bases this statement on the observation that a normal individual can hold his breath comfortably for thirty or forty seconds, whereas a patient with a diseased and compromised heart can hold his breath for only ten, or at most twenty seconds. The test is made as follows. The patient assumes a comfortable posture, and takes a deep inspiration. The physician compresses the nostrils of the patient and directs him to hold the inspired air as long as possible. The normal individual will take a new breath in almost thirty seconds, and will show no respiratory discomfort. If the heart is involved, twenty seconds is the limit, and the patient, when he does take his new breath, shows evidence of dyspnea. Stange is so certain of the value of this test, that he states that no patient who is unable to hold his breath longer than twenty seconds should be subjected to a general anesthetic. Purely pulmonary conditions, such as tuberculosis, pleuritic effusions or bronchitis, do not interfere with breath-holding, according to Stange.

Henderson confirms the facts developed by Stange, stating, however, that Stange fails to furnish his readers with the fundamental fact underlying the phenomenon. According to Henderson the cause of the dyspnea consequent upon holding the breath is the development of an acidosis.

DIAGNOSTIC AND THERAPEUTIC NOTES.

COAGULEN, A NEW STYPTIC.—Kausch (*Deutsch. med. Wochenschr.*, No. 15, 1914). Coagulen is a physiologic hemostatic, devised by Th. Kocher and A. Fonio. It is a coarsely granular brownish powder, consisting of dried, animal blood-platelets mixed with grape-sugar, and marketed in packages of 1.25, 5 and 10 grm. Sealed, the packages keep a long time, but after being opened, the contents should be used within three months.

A 5 to 10 per cent. solution is made with distilled water and sterilized by boiling for a short time. This solution should be used the same day. During the operation, the larger vessels are clamped, while oozing surfaces are rubbed with cotton sponges moistened with the solution. Ordinarily all bleeding ceases promptly; if it does not, one of the moistened sponges is pressed upon the bleeding surface or, if the latter is deep-seated, is used as a tampon. Later, during the operation, the tampons may be cautiously rolled off without causing renewed bleeding.

The preparation is said to surpass all other styptics, especially adrenalin, since it does not lead to after-bleeding. It enables the surgeon to dispense with most of his ligations and hemostatic sutures, diminishes greatly the loss of blood, shortens the time of operation and keeps the field of operation clean and distinctly visible. Postoperative bleeding and infection do not occur; the wounds secrete less and heal more rapidly than without coagulen. It is particularly useful in nasopharyngeal work. The solution may be given internally in doses of 50-100 c.cm. for esophageal or gastric hemorrhage, and intravenously, in the same dose, for conditions associated with impaired coagulability of the blood. When used intravenously, thrombi or emboli never occur.

THYROID IMPLANTATION.—Voronoff (*Gaz. des Hôp.*, No. 75, 1914). At a recent meeting of the Académie de Médecine, Voronoff reported the case of a child, fourteen years old, who had become myxedematous at the age of eight years, following an attack of measles. In every way, physical and psychic, the case was a typical one, with the characteristic imbecile facies. Into the cervical region of this child, he implanted the right lobe of the thyroid (together with its parathyroids) of a large baboon. The operation was followed by most happy results, the child's condition improving steadily. Little by little his face regained its normal color, the nose and lips became thinner, the body became longer and more slender. From being apathetic and almost somnolent, he became lively and even mischievous. At school he surprised everyone by the rapidity of his progress.

Voronoff ascribes the outcome of this, the first successful implantation of a monkey's thyroid into a human being, to the special

technique employed. The essential features of the latter were as follow:—

1. The most rigorous asepsis.
2. The briefness of the interval, not more than a few minutes, that was allowed to elapse between the removal of the gland from the animal and its implantation into the child.
3. The choice of a very vascular region for the implantation.
4. The creation of multiple adhesions, by means of sutures, between the graft and the tissues of the neck. In this manner, new blood-vessels were enabled to penetrate the foreign tissue with unusual rapidity.

If the foreign thyroid persists in this case and the child continues normal, this operation may mark a new era in the treatment of myxedema and allied conditions.

THE PRESERVATION OF RUBBER ARTICLES.—Fangemak (*Aerztli. Sammelbl.*, No. 8, 1914). Rubber tubing, gloves and the like retain their elasticity very well if in constant use, but lose it quickly in storage. This deterioration can, however, be prevented, to a great extent, if certain precautions are taken. The simplest is to keep them in a cool place and to knead them thoroughly once a month. A simpler and even more efficacious method is the following. A rather deep vessel, best of enameled ware, with a well-fitting cover, is provided with a false bottom, the latter with numerous perforations like a sieve. Between the false and true bottoms, a layer of absorbent cotton is placed, saturated with coal-oil. The rubber articles are placed in the vessel, care being taken that they do not touch the petroleum, so that they are immersed in petroleum vapor. The rubber retains its freshness and elasticity indefinitely, the only attention required being the renewal of the coal-oil every three months or so.

Rubber that has begun to get hard and brittle may be softened by kneading it first in a warm 5 per cent. solution of ammonium chloride and then in a warm 5 per cent. solution of glycerine. It should be allowed to drain and dry in a cool, dark place.

THE QUANTITATIVE DETERMINATION OF URIC ACID IN THE BLOOD.—Brugsch and Kristeller (*Deutsch. med. Wochenschr.*, No. 15, 1914). It is often of much diagnostic importance to know the amount of uric acid in the blood, especially in gouty conditions. The methods hitherto used (with the exception of that of Folin) are either grossly inaccurate or require large quantities of blood. The necessary reagents for the new method are a 7.5 per cent. solution of sodium carbonate and a titred solution of phosphotungstic acid. A small amount (15-20 drops) of blood is allowed to flow into a dry test-tube and to clot. With a pipette, 0.1 c.cm. of clear serum is removed and blown into a small test-tube; 2 c.cm. of the soda solution and 0.4 c.cm. of the phosphotungstic acid are added. In the presence of uric acid, a blue color results, the intensity of which is indicative of the amount of uric acid present. Fairly accurate determinations can be made by means of a specially devised, standard color-scale.

PITUITRIN IN THE MENORRHAGIAS OF ADOLESCENCE.—Deutsch (*Zentralbl. fuer Gyn.*, No. 15, 1914). The menstrual bleeding in girls of thirteen to twenty years is often so great as to be a serious matter. Occasionally they are so obstinate and deleterious that castration, either operative or with *x*-rays, or high amputation of the body of the uterus without removal of the ovaries (Schauta) have been suggested. Before resorting to operative measure, however, the systematic use of pituitrin should be tried. One c.cm. of the solution is injected hypodermically at intervals of one to three days, fifteen to twenty injections constituting the ordinary course of treatment. This usually suffices. Occasionally, however, a second course is required after an interval of one to four weeks. No ill effects were observed. The preparation, used by the author, is the one called pituglandol, which is apparently identical with our pituitrin.

THE CALCIUM THERAPY OF BRONCHIAL ASTHMA.—Goeppert (*Med. Klin.*, No. 24, 1914). The persistent administration of small doses of lime salts leads to a considerable improvement in the condition of many cases of bronchial asthma. Calcium lactate may be given in powder, or calcium chloride in 10 per cent. solution, the average daily dose being 4 gm. During an acute attack much larger doses must be given, *i. e.*, 1 to 2 gm. calcium chloride crystals every two hours. The prolonged use of calcium, in these cases, not only alleviates the asthma, but acts as a good general tonic.

DERMATOLOGIC PRESCRIPTIONS.—Brodfield (*Wien. klin. Rundschau*, No. 19, 1914); Meyer (*Deutsch. med. Wochenschr.*, No. 7, 1914). A favorite Austrian prescription for warts is the following:—

R	Chloral hydrate	
	Acetic acid.....	āā. 6.0
	Salicylic acid	
	Sulphuric ether.....	āā. 4.0
	Collodion.....	15.0
M.	Locally.	

The following prescription is useful for teleangectases:—

R	Adrenalin (1:1,000)	2.0
	Zinc oxide.....	15.0
	Lanolin.....	7.5
	Soft paraffin.....	7.5
M.		

For acute dermatitis:—

R	Thymol.	0.3
	Lime water	
	Linseed oil.....	āā. 150.0
M.	Locally.	

BOOK REVIEWS.

THE PSYCHONEUROSES AND THEIR TREATMENT BY PSYCHOTHERAPY. By Professor J. Dejerine, Professor of the Clinic for Nervous Diseases of the Faculty of Medicine of the University of Paris, and Dr. E. Gauckler, Ancien Interne of the Hospitals of Paris. Authorized Translation by Smith Ely Jelliffe, M. D., Ph. D., Adjunct Professor of Diseases of the Mind and Nervous System, Post Graduate Medical School and Hospital, etc. Philadelphia and London: J. B. Lippincott Company. 1913. Price, \$4.00.

This translation of Dejerine's book is worthy of serious comment. In his introduction Dejerine calls attention to the fact that in his book are the results of some thirty years in daily contact with neuropaths. Anything that Dejerine might have to say in regard to a neurological subject is important, and certainly if he can put down the result of his observation for this period of time focused upon a single class of cases, there is certain to be something worth while in his deductions and conclusions.

He divides his book into three parts. The first, or analytic part, is devoted to the study of functional manifestations, that is to the study of all the symptoms which are observed in the cases of psychoneuroses whose exact nature we wish to ascertain. In the second, or synthetic part, an endeavor is made to clear up the general mechanism of the foundation of the psychoneuroses as well as its deviations and variations. The third division is therapeutic, and in it are set forth the psychotherapy proceedings and helps which he feels are the only measures which should be used in the treatment of the psychoneuroses.

The method of discussion is purely clinical, and is based upon a consideration of symptoms which are met with in the neurosis. For this reason there is a certain definite arrangement which is an aid to understanding, but which makes the book altogether too much like a formal textbook. For example, each chapter starts out with an effort to divide the subject treated in a purely formal way. The divisions are enumerated under A, B, and C, or whatever particular division would seem necessary. The trouble with this method is very obvious, and that is that a division into separate types is much more precise than is customary to find in the actual cases. In cardiovascular apparatus, for example, the divisions are first, action of emotion on the heart, second, phobias of the heart and the pericardiac phenomena. It is difficult for one to appreciate, however, that the two are not so definitely separated as the author would have us to understand. This method of description would be of service in any less intangible subject than the psychoneuroses, in which mixed types are by far the more frequent, and where arbitrary division seems but a scheme toward simplifying a subject which as a matter of fact is and always will be an extraordinarily complex one.

The third part is given over to treatment and to consideration of methods of psychotherapy. It is to this part which the reader naturally turns with the greatest interest, and it may be said that this part of Dejerine's book seems to the reviewer to be far more significant than the preceding clinical descriptions. There is contained here a very broad résumé of the whole subject written in a very simple way and containing practically every thing of importance.

There are two things which mar the excellence of this book. One is the complete avoidance of any discussion of the Freudian psychology, and second a very poor and insufficient index. The only reference to Freud found, according to the index, is a brief mention by the translator.

The translation is very well done. The book reads easily and well, and there seems very little occasion to question the accuracy with which Dejerine's ideas are turned into English.

This book can be recommended to those who desire some notion of psychoneuroses as presented by one who has had a large experience and who values his experience in a large way. That it is a rather one-sided presentation of the subject does not necessarily deduct from the value of the book, provided always that the reader is aware that this is so.

PSYCHANALYSIS. Its Theories and Practical Application. By A. A. Brill, Ph. B., M. D., Chief of the Clinic of Psychiatry and Clinical Assistant in Neurology, Columbia University Medical School; Chief of the Neurological Department of the Bronx Hospital and Dispensary, etc. etc. Second Edition, Thoroughly Revised. Philadelphia and London: W. B. Saunders Company. 1914. Price, \$3.00.

The second edition of Brill's "Psychanalysis," the first of which has been previously reviewed in these columns, tends to increase the reviewer's estimation of the book. A more careful reading of the second edition gives the impression of greater care in presentation than was apparent in the first edition, and gives the impression likewise of a better hanging together of the subject material.

Of all Freud's various theories, the theory of wit seems to the reviewer's mind to have the least foundation in fact. Brill's presentation serves to intensify this impression. It may occur, however, to the reader that inasmuch as this is purely theory, his conclusions must be those of a theoretical conclusion and nothing more. Its obvious purpose, of course, is to supply for wit an underlying basis of suppression in order to fit in with the rest of the Freud suppression psychology. The obvious effort to do this is only too apparent, and one feels that Brill is rather aware of this himself. A more careful reading of some of the psychanalyses, particularly those of dementia præcox and of paranoia are strongly suggestive of the tremendous value of this method, at least for understanding the various symptoms which mental cases present. There is no doubt in the reviewer's mind that whatever the service of Freud may finally come to be, the widening of the intellectual horizon of the examiner deserves perhaps the chief emphasis, and nowhere in English, so far as the reviewer knows, can this phase of the Freudian doctrine be more appreciated than in this book of Brill's.

There are scattered throughout all the chapters many personal views and deductions from observation, and this adds much to its value. The fact that in many instances one cannot agree serves only to stimulate the reader's curiosity, and to create in his mind a feeling of critical doubt and a desire to find out for himself if many of these statements are true. Perhaps, after all, this is one of the best tests of a good book which is written on such a debatable question.

It seems to the reviewer that no physician at the present time should be without some knowledge of the subject treated in this book. Whether he agrees or disagrees is of little consequence. It should be a matter of appreciation that Brill has enabled the physician, with or without a neurological interest, to become acquainted with the Freudian psychology in such a pleasant and interesting way.

CAUSES AND CURES OF CRIMES. By Thomas Speed Mosby, Member of the American Bar; Former Pardon Attorney of the State of Missouri; Member American Institute of Criminal Law and Criminology. Author of "Capital Punishment," "Youthful Criminals," "Alcoholism and Crime," "Mothers of Bad Boys," and Other Essays. St. Louis: C. V. Mosby Company.

This book is of value not because it adds anything particular to our knowledge of criminology, but because it gives the individual point of view based upon a large experience among criminals in the author's official position of a Pardon Attorney. It is an interesting commentary on the growth and development of the interest in criminology which has impressed a purely legal officer with the necessity of considering crime other than a purely legal matter. The author has read widely concerning his subject, but without much discrimination and with no critical attitude. On such subjects as eugenics, he has included a great deal of extraneous matter which is at present still very debatable. In these chapters, likewise, are contained many individual opinions of the author's, which in themselves are of interest, but which have very little to do with the subject itself. There are many statements that will not bear criticism and many that are exaggerated and flamboyant. Perhaps the best chapter in the book is the one entitled "Theory of Punishment," which is written in a very much quieter tone and with a great deal more regard for the actual state of opinion on this very debatable question. The chapter on the "New Penology" is marred by a large number of diagrams of instruments supposed to be used in the psychological laboratory in the study of criminal and normal individual. Most of these instruments have long been discarded and the conclusions derived from examinations with them are no longer considered seriously. There are six illustrations of different kinds of calipers, none of which

would be found in the equipment of a modern laboratory on account of their imperfection and clumsiness.

This book can scarcely be recommended to the intelligent reader as throwing any special light on the subject which it attempts to treat. Its chief faults are lack of a definite plan, discursiveness, and lack of careful study and analysis of the material which no doubt has passed through the hands of its author. The author's purpose in writing this book is a laudable one, indicating a feeling that a legal officer of this kind should attempt to broaden his horizon by extra legal considerations concerning the criminal.

ESSENTIALS OF NERVOUS DISEASES AND INSANITY. Their Symptoms and Treatment. By John C. Shaw, M. D., Late Clinical Professor of Diseases of the Mind and Nervous System, Long Island College Hospital Medical School. Fifth Edition, Thoroughly Revised. By Louis Casamajor, M. A., M. D., Chief of Clinic, New York Neurological Institute; Assistant Neurologist, City Hospital, New York. Illustrated. Philadelphia and London: W. B. Saunders Co. 1913. Price, \$1.00.

There is very little to say concerning the merits of this book, except to express profound sympathy with its revisionist. Neurology and psychiatry are such vital and fascinating departments of medicine that it is a matter of regret that an attempt should be made to compress them in the narrow limits of a treatise of this kind. All that is really living in these subjects finds no place, and what remains is a bald recital of facts, without interest, without connection, and, alas, not without error. Accuracy of statement might, at least, be assumed in a book of this sort, and important omissions should be avoided.

The attempt at bibliography is rather appealing. On *tuberculous dorsalis*, for example, 1903 is the last bibliographical reference. Plaut's well-known work on the serum diagnosis of syphilis comes under the name of "Plant."

In the chapter on multiple sclerosis no mention is made of the eyeground changes.

The only reference to aphasia is a textbook reference to the year 1909. Amyotrophic lateral sclerosis has one reference to the year 1901. If, as the author of the present treatise states in his introduction, neurology and psychiatry undoubtedly lead to-day all other branches of medicine in the rapidity of their progress, then it is a sad commentary on that progress that it should have ceased, apparently, as far as contributions to the literature are concerned, some ten years ago.

This book is certainly not to be recommended to the student, for whose use it is planned. To the more mature physician, or to the specialist, it would be only an irritating reminder of the methods of a forgotten period in medical education.

ACUTE POLIOMYELITIS (Heine-Medin's Disease). By Dr. Ivan Wickman of Stockholm. Authorized English Translation by Dr. J. Wm. J. A. M. Maloney, F. R. S. Ed. Illustrated. New York: The Journal of Nervous and Mental Disease Publishing Co. 1913. Price, \$3.00.

There is no better monograph on acute poliomyelitis than Wickman's, and this translation into English through the efforts of the *Journal of Nervous and Mental Diseases* should be received with delight by those who are unable to read the original papers of the Stockholm neurologist.

The chapter on the pathology of poliomyelitis leaves little to be desired, but so much has been done in this country, particularly at the Rockefeller Institute, on this subject, that little that is new can be found here. The chief merit of Wickman's monograph, however, is to be found in the clear description of the clinical varieties of diseases. The careful observations based upon a large experience are set down here in a most attractive way.

Wickman's studies in regard to the spread of the disease from place to place, his observations on the epidemiology, are very illuminating. All in all, there is no monograph known to the reviewer which in a comparatively small number of pages brings the subject of poliomyelitis before the reader's mind so vividly.

A word might be said in praise of the translation, which is clear, concise and readable.

The reviewer wishes again to express his appreciation to the editors of the *Nervous and Mental Disease Monographs* for their good judgment in selecting so important a piece of work for wider publication. This little monograph should be in every practitioner's library.

RADIUM AND RADIOTHERAPY. Radium, Thorium and Other Radio-Active Elements in Medicine and Surgery. By William S. Newcomet, M. D., Professor of Roentgenology and Radiology, Temple University, Medical Department; Physician to the American Oncologic Hospital, etc. Philadelphia and New York: Lea and Febiger. 1914. Price, \$2.25.

Two features in radium therapy are noticeable. First, the wealth of favorable comment in Continental medical literature and second, the dearth of satisfactory case reports in America. The latter may be due to the poor quality of radium salts sold to Americans. Again, exploitation rather than studious application may account for the attitude of the thinking American profession toward radium. We believe that Dr. Newcomet's book will have a wholesome effect. It reflects the scepticism of the American mind and at the same time supports a belief in the value of radium therapy when intelligently and conscientiously applied. Due consideration is given to the hygienic measures which should attend the use of radium emanations and other semivisionary methods of application.

We find the use of the term 'selective action' of radium quite as frequently in the early radium literature as in early roentgen therapy writings. Newcomet explains this as an apparent rather than actual selective action dependent upon characteristic changes in different tissues when influenced by irradiation or other irritations.

Certain evidence is apparent in this book to indicate that it has been rather hastily prepared. The index is scanty and incorrect in spots. For instance, 'selective action' should be indexed p. 147 instead of p. 92. The physical qualities of radium are described by quotation in great part and the number of these reports by the author are few. These criticisms need not detract from the value of the book as a reasonable exposition of the present status of radium therapy.

HYPNOTISM: ITS HISTORY, PRACTICE AND THEORY. By J. Milne Bramwell, M. B., C. M., Author of 'Hypnotism and Treatment by Suggestion,' etc. etc. Third and Cheaper Edition. London: William Rider & Son, Ltd. (J. B. Lippincott Co., Philadelphia). 1913. Price, 12 s. 6 d.

The history, practice, and theory of hypnotism has been reviewed before in these columns. This third edition differs in no essential way from the others with the exception that it is larger and contains a more comprehensive bibliography.

What was said in the former book review should be repeated here. The chief value of this book is its historical side, its discussion of hypnotic theories, and its rather complete list of references. As far as the case references are concerned, and as far as the discussion of the efficacy of hypnotism as a therapeutic measure, Bramwell's book fails, as do most others on the subject. No well informed physician at the present time refuses to acknowledge that hypnotism is a condition that can be induced in a good number of patients, nor do they refuse to believe that during the hypnotic state, suggestions can be implanted in the patient's consciousness; but it has come to be thoroughly well determined that there are other means by which the same kind of influence can be brought about—methods much less dangerous, much less mysterious, and much more permanent in their results. For this reason, if for no other, hypnotism has ceased to be a method of choice in the hands of the neurologist.

What was said of the case references in the previous comment on this book can be again said here. They are incomplete and without any force so far as supporting the efficacy of hypnotism.

PHARMACOLOGY. Clinical and Experimental. A Groundwork of Medical Treatment, Being a Textbook for Students and Physicians. By Dr. Hans H. Meyer, of Vienna and Dr. R. Gottlieb, of Heidelberg, Professors of Pharmacology. Authorized Translation into English by John Taylor Halsey, M. D., Professor of Pharmacology, Therapeutics, and Clinical Medicine, Tulane University. With 65 Text Illustrations, 7 in Color. Philadelphia and London: J. B. Lippincott Co. 1914. Price, \$6.00.

Starting on the basis of physiological principles, the authors have written a textbook of pharmacology which marks another step in the advance of rational drug therapy. There can be no better answer to the charge that our present day medical science teaches the doctrine of therapeutic nihilism than such books as this. A proper scientific doubt, an inquisitive attitude, a desire to know, not only that certain drugs act but how and why they act,—this does

not lead to nihilism. Scientific drug therapy is the aim of the authors, and the subject is treated purely from the physician's point of view, omitting those pharmacological facts which are not directly available in practice. This does not exclude the discussion of theoretical considerations, but it limits these to their bearing on practical points. Such topic headings as "Treatment of Vasoconstriction," "Factors Controlling Diuresis," "Clinical Aspects of Digitalis," and "Theory of Narcosis" indicate the broad plan upon which the work is written. It recommends itself as a textbook both for physician and student. There are abundant references to the literature in each chapter and the translator has made many and valuable critical additions to the original text.

THE PHILOSOPHY OF RADIO-ACTIVITY OR SELECTIVE INVOLUTION. By Eugene Coleman Savidge, Member New York Academy of Medicine, New York Obstetrical Society, American Medical Association, New York State Medical Society, etc. etc. New York: William R. Jenkins Company. 1914. Price, \$1.50.

"Is the love of a ton of lead for the Earth's centre stronger than the nostalgia of matter for the 'rest' period of its longest duration?"

"Duration, indwelling fractions of space, is therefore the determining reality, the synotic key which non-materially compresses into the color patch, attuned to ignore all other chatter, and draw from about it, its precise necessity of reinforcement."

The above quotations are from Dr. Savidge's most recent book and just such clear descriptive passages are on every page. The reviewer is non-plussed. In spite of the fact that we have read and understood Kant's "Critique of Pure Reason" (which should qualify any reviewer as possessed of unusual perspicacity) we must admit that we do not know what Dr. Savidge is talking about. Neither can we solve the riddle of the tender love couched within the soul of a ton of earth. Rather would we ask in turn: "If it takes three hours for an anapheles to walk the length of a bar of soap, how many gallons of sorghum molasses does it take to make a German airship?"

We commend the book as a soporific, but warn against its use in case the reader is of an excitable nature.

DISEASES OF THE HEART. By John Cowan, D. Sc., M. D., F. R. F. P. S., Professor of Medicine, Anderson's College Medical School; Physician, Royal Infirmary, etc. etc. With Chapters on The Electro-Cardiograph, by W. T. Ritchie, M. D., F. R. C. P., Physician, Deaconess Hospital, etc. etc. and The Ocular Manifestations in Arterio-Sclerosis by Arthur J. Ballantyne, M. D., F. R. F. P. S., Surgeon, Eye Infirmary, Glasgow. Philadelphia: Lea and Febiger. 1914. Price, \$4.00.

During the last ten years great advances have been made in our knowledge of diseases of the heart and arteries. New methods of histological technique have revealed lesions which were hitherto unappreciated, and experimental research has deciphered their causes. The sphygmomanometer, the polygraph, the electro-cardiograph, and the Roentgen rays, have become accessible to the clinician, and the data thus acquired have elucidated some of the many problems which awaited solution; while the pharmacologists have defined the uses of such drugs as digitalis more accurately than had been previously possible.

In Cowan's book the whole subject is reviewed in the light of these recent advantages. The polygraph tracings are from his own cases and are, many of them, of great interest. The chapter on the electrocardiograph is perhaps unduly brief, but after all, this is a method at present out of the reach of the general practitioner. The latter will certainly find the book of value. If not as fascinating or stimulating as Mackenzie's classical volume, it is more complete and more suitable for ready reference.

IMMUNITY. Methods of Diagnosis and Therapy and Their Practical Application. By Dr. Julius Citron, Assistant at the University Clinic of Berlin, II Medical Division. Translated by A. L. Garbat, M. D., Assistant Pathologist and Adjunct Visiting Physician, German Hospital, New York. Second Edition, Revised and Enlarged. 30 Illustrations. 2 Colored Plates and 8 Charts. Philadelphia: P. Blakiston's Son and Co. 1914. Price, \$3.50.

The methods of laboratory diagnosis are constantly stimulating greater interest in all branches of medical science. The present book aims to present these methods in such a manner that even the general practitioner, who is only slightly acquainted with laboratory work, can learn the details of the various reactions and their significance. Presented by a master of the subject

there can be no question of the value of the critical manner in which the various chapters are written. Two chapters are devoted to a consideration of tuberculin. This is particularly gratifying, for despite the wide use which it has gained both as a diagnostic and therapeutic agent, it is treated most inadequately in our ordinary textbooks.

There is likewise an interesting chapter on the important subject of chemotherapy. Salvarsan is certainly only the first important step in chemotherapy, and the work which is being done along similar lines, in the investigation of malignant tumors, promises much. The book is thoroughly up-to-date and cannot be too highly recommended.

HANDBUCH DER PRAKTISCHEN CHIRURGIE. Bearbeitet und Herausgegeben von Geh. Rat Prof. Dr. P. von Bruns, in Tuebingen, Geh. Rat Prof. Dr. C. Garré, in Bonn, und Geh. Rat Prof. Dr. H. Kuettner, in Breslau. Vierte umgearbeitete Auflage. Fuenf Baende. V. Band. Chirurgie der Extremitaeten. Mit 770 theils farbigen Textabbildungen. Stuttgart: Verlag von Ferdinand Enke. 1914. Price, 35.20 m.

This is the last volume of the latest (fourth) edition of the now classic "Handbuch der Praktischen Chirurgie." Just as in all the previous editions, this volume is devoted exclusively to the surgery of the extremities. Aside from the rather extensive amount of work that has been done in the past few years on the treatment of fractures, there have been few striking additions to the surgery of the arm and leg regions; and it is for this reason that this fifth volume does not differ markedly from the fifth volume of previous editions.

Hofmeister describes the anomalies and diseases of the shoulder region, elbow and forearm, appending under each head the corresponding operative treatment. Friedrich, in 150 pages, discusses very fully the wrist-joint and hand. Von Bruns covers, with admirable thoroughness, the hip-joint and femur, Reichel has the chapter on knee-joint and leg, and Borchardt ends the volume with a very full and extensive treatise on the ankle-joint and foot.

This series of volumes, comprising the new edition, is an essential to every working library that makes even the slightest pretense to completeness.

DISEASES OF THE RECTUM AND COLON AND THEIR SURGICAL TREATMENT. By Jerome M. Lynch, M. D., Professor of Rectal and Intestinal Surgery, New York Polyclinic, etc. etc. Illustrated with 228 Engravings and 9 Colored Plates. Philadelphia and New York: Lea and Febiger. 1914. Price, \$5.00.

Dr. Lynch, in his preface, makes it perfectly plain that his aim is not to produce either an encyclopedia or a book for the rectal specialist. Bearing this fact in mind, the reviewer feels that the author has fairly accomplished his purpose and yet, considering the large number of satisfactory textbooks and handbooks on diseases of the rectum that are already on the market, one does not experience any particular glow of enthusiasm as a result of going through this volume.

There are thirty-two chapters; and these chapters are headed and arranged in the manner that has practically become formal in books on the rectum. As notable exceptions to this formal arrangement, however, we may mention the chapters on Cryptitis and Papillitis, Appendicostomy, Pigmentation of the Bowel, Short Circuiting, and Serum and Vaccines.

The volume, is safe, sane, concise and clear, excellently illustrated and well gotten up throughout. It is meritorious, in particular, in that it is written largely from the personal point of view.

DISEASES OF THE SKIN. By George Thomas Jackson, M. D., Late Professor of Dermatology, College of Physicians and Surgeons, New York; Consulting Dermatologist to the New York Infirmary for Women and Children, etc. etc. With 115 Illustrations and 6 Plates. Seventh Edition, Thoroughly Revised. Philadelphia: Lea and Febiger. 1914. Price, \$3.00.

As the author says in his preface: "The aim of this book has always been to furnish students and practitioners with a comprehensive, yet compact, exposition of dermatology."

This, the seventh edition, has been thoroughly revised and brought up to date. Chapters on some of the later subjects have been supplied by other writers, particularly those chapters dealing with vaccines, the treatment of syphilis by means of salvarsan, and the newer methods of the therapeutic use of the x-ray.

The reviewer knows of no more practical or thoroughly accurate book upon the subject. The alphabetical arrangement is a great assistance to ready

reference. The well-known standing and conservatism of the author enable the reader to obtain in a concise way a judicial survey of all of the later ideas upon the subject of dermatology and syphilis. The illustrations are very good, indeed, and the publishers have produced a noteworthy volume.

VACCINE AND SERUM THERAPY. Including Also a Study of Infections, Theories of Immunity, Specific Diagnosis and Chemotherapy. By Edwin Henry Schorer, B. S., M. D., Dr. P. H., Formerly Assistant Thomas Wilson Sanitarium for Children, Mt. Wilson, Maryland, etc. etc. Second Revised Edition. St. Louis: C. V. Mosby Company. 1913. Price, \$3.00.

Since the introduction of the newer methods of vaccine and serum therapy, we have been in grave danger of stepping back to our old empirical methods in therapy. And only a comprehensive and rational understanding of the facts underlying these recent therapeutic measures can save us from such an undesirable course. It is for this reason that the present volume is especially valuable at this time. The second edition has been brought up to date and some of the newer ideas in chemotherapy have been incorporated. Not the least worthy portion of the book is the chapter devoted to tuberculosis, for despite the importance of the subject our usual textbooks treat of it in a most general and vague manner. The technique of the preparation of the various vaccines is minutely described. The book should find a wide distribution.

HANDBUCH DER PRAKTISCHEN CHIRURGIE. Bearbeitet und Herausgegeben von Geh. Rat Prof. Dr. P. von Bruns, in Tuebingen, Geh. Rat Prof. Dr. C. Garré, in Bonn, und Geh. Rat Prof. Dr. H. Kuettner, in Breslau. Vierte umgearbeitete Auflage. Fuenf Baende. IV. Band. Chirurgie der Wirbelsaeule und des Beckens. Mit 363 teils farbigen Abbildungen. Stuttgart: Verlag von Ferdinand Enke. 1914. Price, 30.20 m.

The fourth volume of this well-known "Handbook of Surgery" takes up, in ten chapters, the surgery of the spinal column and cord, bony pelvis, kidney and ureter, male and female, bladder and urethra, the prostate, testicle, and penis. As in the past editions, each chapter concludes with a condensed bibliography, which has, in admirable fashion, been brought up to date.

There are some books that do not call for specific detailed criticism, and among such books is the encyclopedic "Handbook of Surgery." When one says, that in most of the moot points of surgery, these volumes must be consulted somewhat as a counsel of perfection, one has emphasized sufficiently the necessity of placing them in a prominent place in the library.

NERVES. By David Fraser Harris, M. D., C. M., B. Sc. (Lond.), D. Sc. (Birm.), F. R. S. E., Professor of Physiology in the Dalhousie University, Halifax, Nova Scotia, Author of "The Functional Inertia of Living Matter," etc. etc. New York: Henry Holt and Company. 1913. Price, \$0.50.

This is a popular treatise on nerves, written by a physiologist. He attempts to explain in non-technical language the place and function of the nervous system. It must be said of this book that it carries out its design effectively, and attempts no more than is implied in its introduction. On the whole one can read this book with a great deal of pleasure. The style is lucid and devoid of technicalities as much as is possible in treating a subject so complex as this is. For those whose knowledge of the nerves has not passed beyond the stage of elementary curiosity for some information on this subject, this book can be very heartily recommended; and even to those whose knowledge may be supposed to have become crystalized, this book may serve to freshen their interest and may afford a pleasant experience in seeing how wide the application of the laws governing nervous action have become.

THE HYGIENIC MANAGEMENT OF LABOUR IN THE TROPICS. An Essay. (With Which is Incorporated the Labour Code by Courtesy of the F. M. S. Govt.) By P. N. Gerrard, B. A., B. Ch., B. A. O., M. D., Dublin University, D. T. M. H. Cambridge University, etc. etc. Singapore, Straits Settlements: Methodist Publishing House. 1913. Price, \$2.00.

To the American reader at least the title of this comprehensive essay is misleading. It has to do, not with parturition, but with the hygienic care of contract laborers as the problem has to be met on the large estates in India and the surrounding countries. The essay is valuable from the economic as well as the medical side. Detailed ground plans with measurements, etc., for the construction of houses, the digging of wells and other necessities of a civilized community are given.

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EDITORIAL.

THE PLEASURES OF EATING.

So much has been written of late in our medical journals on the subject of what one ought to eat, how one ought to eat, why vegetables have qualities far superior to meat, how corpulence can best be combated, and why, if a dog can thrive on a certain amount of proteins and carbohydrates, the human individual should not be content and also thrive on a like amount, that it is with a sense of relief that one turns to an essay in a lay magazine in which no thought is given to the 'scientific' quantity of food that should suffice, but a great deal of kindly thought is expressed on the topic of the natural appetite of man in the presence of appetizing foods. Mr. Bernard Capes, writing in *Blackwood's Magazine* for July on "The Pleasures of Eating," is distinctly unmodern in that he is not ashamed to confess that he really likes to eat, that he has the courage to rank the Pleasure of Eating with those hackneyed subjects of all poets, be they men of genius or mere rhymesters—the Pleasure of Hope and the Pleasure of Memory. And that he is blatantly ignorant of what we medical men have written for the undoing of all pleasure attached to eating in a natural way, the following quotation will illustrate: "Gastronomy: the titillation of the palate! What a cheering subject it always is, if one only had the moral bravery to admit it. People talk food with a certain shamefacedness, a pretence of no more than an abstract of dietary interest in a subject they must not be thought to take too seriously. And all the time the important, the substantial business of life lies in eating, and every man, like every horse, knows it."

The foregoing expression may not have been conceived by the writer for any other reason than to state a truism that few of us

heed; but, even so, must not the naturalness of what he says appeal to all medical men, no matter how deep their thought has been on what one should eat to conserve health and strength and the modicum of mental peace that makes life really worth living? Is it not true that altogether too much has been written both in medical and lay journals on the subject of what we should put into our stomachs and the dire results which must follow the slightest deviation from the hard and fast rules laid down by each writer? It may be that in a scientific way we have achieved excellent results in regard to the exact quantity of food and also what its quality should be for the human; but, in doing this, have we limited our exploitations to the circle of serious-minded men who could write intelligently on the subject? We think just the opposite has been accomplished, and we think this because no day passes that some wight does not write in the daily press some article on what humans should eat to safeguard themselves against disease and those terrors of the middle-aged—overwrought nerves and obesity, some article that is a garbled version of what a truly scientific man has advanced so as to benefit mankind. But not considering the daily press at all, are our medical journals devoid of similar articles, that seem to be put forth in a truly malicious spirit so that the art of eating, by which we mean its graces and its pleasures, shall be of such minor importance, that to mention it in the welter of the discussions that circle round the topics of the day is equivalent to mentioning a frivolous unscientific subject in the midst of weighty problems.

Yes, it can truly be said that in our effort to enlighten man as to what should be his proper diet we have put very foolish ideas into heads and wrought considerable evil. Who has not heard some apparently healthy man wrongly (let us hope it is wrongly) quote his doctor as to what he must eat and what he must avoid? And even though we may argue with him for days in an attempt to prove the falsity of his statements, does common sense triumph any too often over a vagary that soon becomes a fixed idea when it is a matter concerning his stomachic welfare? If doctors knew human nature better, or if they were closer students of the mental antics of that comic creature, Man, they would soon learn that a casual remark on the subject of food is magnified by the patient into one of importance and is thought to be so momentous that in the latter's opinion it should be passed on to relatives and friends so that they too can be saved. Let the same physician warn his patient against overworking his brain, and slight attention will be

paid to his monitions; for is not the brain always on terms of friendship with the comic creature's ambitions and endeavors, whereas the stomach is a lowly, rebellious organ that must be disciplined or it will break out in open revolt?

No better illustration of what Mr. Capes calls our shamefacedness when we talk food can be found than in the novels which are written to-day and which are being read with avidity by the 'better class' of readers. Who can find, even after a diligent search, any mention of food in the books of Wells, Galsworthy, Bennett or Chesterton? The heroes and heroines tackle all the problems of the day apparently on empty stomachs, or after so heavy a meal as tea and scones. They never sit down quietly to roast beef, calf's head hashed, a leg of mutton, chickens, ducks, vegetables, plum pudding, tarts, jellies, pies, and puffs as did the men and women in the works of Fielding, Smollett, Sterne, Dickens and Thackeray; or if they do,—and knowing men and women quite well we feel that they must have some sort of appetite and have it appeased in a solid way, otherwise they could not talk so volubly as is their wont in modern novels,—the author practises the shamefacedness mentioned by Mr. Capes and hesitates to mention food lest the reader will cry out against such a vulgarization of literature. Now, it cannot be said that the modern novelist is not alert as to medical matters and that he does not know something of the tendencies in medicine. He may not know how to describe diseases better than did his predecessors, but the popularization of medical subjects in the lay journals has not escaped his notice. And what easier to grasp than the modern abhorrence of the mention of food? What more pleasing to the modern reader? How can one be so low as to mention the absolute necessity of a hero or heroine giving up an hour or so daily to the eating of meat and vegetables when such momentous questions are assailing both as the reconstruction of society, the study of inherent sin, and whether or not marriage is an institution or only a means to a natural end—divorce? Would not a description of the pleasures of eating fit in awkwardly with all these burning questions and others which we have not mentioned, but which are of like importance? Verily, the modern novelist has learnt one medical lesson well—that the pleasure of eating is unscientific, that in England tea and scones and in America the Dairy Lunch are substantial food and make for refinement, whereas meat and vegetables should never be mentioned except in an apologetic manner, and then only as an indisputable indication of the moral downfall of a man or woman.

P. S.

MOVING PICTURES AND THE HIGHER EDUCATION OF THE PUBLIC.

Nowadays the atmosphere surrounding us seems to be sticky with the word 'culture,' and on all sides we hear that to be cultured should be the aim of one's existence. In fact, we have bandied this word until it has become so great an ornament of one's conversation, so easy of application on account of its manifold interpretations, that no conversation, even among those who heretofore have not been keen to use big words, is thought to be up to date unless this expression is used at short intervals. And what more natural than that it should have gained a foothold in medicine, and that already we hear quite intelligent doctors talk about culture coming from certain geographical districts, mostly foreign, and that it must be nurtured and encouraged most assiduously once it has become transplanted to American shores, or otherwise we will have to pay a heavy penalty for our carelessness. Do we not speak of cultured doctors, cultured manners, general culture as opposed to special culture, cultured style of writing, books for the cultured, plays for the cultured, and lastly medical books of so high a degree of science that only a certain cultured nation could produce them for the further knowledge of certain cultured members of the medical profession in this country? From the time of the obtrusion of this word into our general conversation, its popularity has proceeded by leaps and bounds until nothing, be it never so commonplace, can escape being subjected to the white heat of culture in the hope of finding out whether it can stand the test, or must be dropped as an ignominious and worthless thing. Remembering all this, it should not surprise any doctor that even that form of entertainment which is known as 'moving pictures,' and which was heretofore considered an innocent form of amusement and especially designed to make the weary hours of the working classes less weary, should be causing considerable discussion in our lay and medical journals, because it lacks those cultural insignia without which no entertainment is really worth while to-day.

When the medical profession first took up the matter of the deleterious effects of moving pictures on an audience, it was stated that several people suffered from a disturbance of the eyes brought on by the flickering; and considerable comment was made, which took the shape of warning those, who had to some extent suffered from the inconvenience, against sitting too close or attending too often, a warning, we regret to say, that was often unheeded. But

this medical interference with the enjoyment of this form of entertainment was mild compared to what is in the air at present, for not only are the lay reformers exceedingly active, but our irrepressible medical reformers are loud in their denunciations of the evil wrought on the morals of an audience that sits spellbound under the influence of moving pictures. To take up only what medical men have written, we glean from their essays that the concentration, the complete absorption in the story as it is unfolded has a weakening effect on the nerves; and when the various chapters are illustrated in a highly dramatic manner and, as often happens, in a sensational manner, so weak is human nature that the wrong lessons are learned; in short, many return again and again, the serious side of life is forgotten, a moving picture habit is formed, and wan faces and overtaxed brains are the outcome. To correct all this it has been suggested that if the pictures could be made on a higher moral plane, if the higher intellectual qualities of the audience could be aroused by showing scenes depicting the life of the early Greeks or Romans at home and in the battlefield, a new era would be inaugurated, and no longer would men and women neglect their serious duties, no longer would brains be overtaxed and faces have a deadly pallor. To effect this beneficent change Boards of Censors have sprung up here and there, and the erstwhile cowboy who brandished his pistol on the slightest provocation, the man who stole some ten thousand dollars to buy his wife enough food to keep her and the one solitary child from starvation until he could get work, which generally happened a few hours later, the distraught maiden who married a banker's son only to find out that he was an ex-convict, the drunken husband who returned home to rob his wife of her savings and incidentally broke up the furniture, are trembling in the balance, so effective has been the work of both lay and medical reformers. Instead of the enervating picture showing the sordidness of life, the criminal tendencies of the unenlightened and also of the enlightened, we have "Cabiria," "Quo Vadis," "Spartacus" palpating with Greek and Roman torture scenes!

It has often occurred to us that when medical reformers get outside their natural province they make a sad mess of their endeavors. In the first place, the majority of people who frequent picture shows do not care a rap for early Greek or Roman history, and never will no matter how often they are compelled to undergo the torture of compulsory culture. What they do care for and do enjoy are the scenes from the daily life they read about in the newspapers or

hear about from their friends. They enjoy the triumph of virtue, the horrible death of the villain, the reward that comes from self-sacrifice, the reformation of the drunkard, the gambler and the thief. Now, to say that because they enjoy this sort of thing, they are going to lose all interest in their vocations and are going to suffer from weakened brains and distraught nerves, is a very wrong conception of the equilibrium which the majority of the people fortunately possess. Enjoyment is to them a boon and a tonic; and just because they take a greater interest in the pictures which they can conceive of as within the bounds of possibility, and which have the crudenesses which go with the lives of the unrefined, than in historical scenes, should not be counted against them or held responsible for the moving picture habit. Better, indeed, and much more moral are the pictures of the cowboy and the reformed gambler and the reformed thief than those showing the unspeakable tortures of ancient history and the nastiness of such reels as the "House of Bondage," "The Drug Habit," "Damaged Goods," "Traffic in Souls," and their many variants. P. S.

LITERARY NOTES.

We are hearing a deal just at present of the kindly and effective workings of the various Red Cross Societies and the great good that always comes out of sound organization. In Mrs. St. Clair Stobart's "War and Women" (The Macmillan Company, New York), there is a full account of the nursing which was done during the Balkan War by a number of English women who hazarded a good deal in the way of comfort and of health in the humanitarian work of giving their assistance to the wounded of an alien nation, thus, as Viscount Esher says in the Prefatory Note, "opposing my publicly stated objections to sending assistance to foreign armies engaged in war, on the ground that any help whatever (however humane the motive) is a breach of neutrality and is tantamount to taking part in the war. This record of the Convoy Corps' achievements in the Balkans proves how effectively a body of well-meaning, philanthropic and earnest folk can assist combatants, patching up wounded to go and kill and maim their opponents, thus breaking the law of neutrality as completely as though they supplied arms, or cash, or munitions of war, or even volunteers, in a cause which is not the cause of our land and people." Now we have here a very vital point in the matter of whether a Red Cross Society should nurse only its own people or extend its province so that any nation may reap the benefits of its kindly offices. According to Mrs. Stobart, the British Red Cross Society does not take the work of women in times of war as seriously as it should, hence her secession from its ranks, and her

independent work assisted by those in sympathy with her views. That her work was well worth while in the Balkan War needs no further comment here, for she brought to bear upon it the enthusiasm and earnestness which must go with undertakings of this sort if they are to spell success. If, as Viscount Esher says, she overstepped the bounds of what the British Red Cross Society's real functions are, that is the nursing of its own kind when engaged in war and not the wounded and sick of a foreign nation which, in no sense, is an ally of Great Britain, and hence violated the law of neutrality, this is a point greatly in her favor; for though laws that are man-made are formidable things, to be sure, and should be respected, when it is a matter of assisting the helpless they should never be enforced to thwart the working-out of that better law—humanitarianism. It may be patriotic to have a British Red Cross Society, a German Red Cross Society, a French Red Cross Society, but the wounded cannot make these fine distinctions; and since the basic principles of all organizations that are launched for the relief of the injured and the sick should be above the petty distinction of nationality, we feel that Mrs. Stobart was not only right in what she did, but has set forth in her book a splendid message to all nursing societies that are engaged in relieving the sufferings of the helpless during war.

In the light of what is happening to-day in the most civilized countries of Europe, it would be well for those readers, who are still possessed of cool judgment and calm and collected thought after the many onslaughts on their intelligence by kindly disposed friends and just as kindly disposed articles in the Press, to study Norman Angell's "*Arms and Industry—A Study of the Foundations of International Polity*" (G. P. Putnam's Sons, New York), if only to ascertain how easily the military spirit can smash into smithereens all the nice and respectable and deeply cherished theories which should be in force to-day in amalgamating the nations into a universal brotherhood. Mr. Angell writes with a spirited pen and his views are sound and just; but though his lessons are fraught with moral reflections of a high order and the tale he tells has a persuasive quality that cannot be denied, he yet fails to grasp the underlying motives of all warfare—egomania rampant, egocentricity rampant, and brute force as the ashlar upon which rests the continuance of a country as a World Power. In the quiet of our study it may be well to speak of commercial rivalry, of ambitions large and small, of cultural undertakings for the sake of the benighted, of the desire to teach lasting lessons of civilization, as the real reasons why men of different nationalities cannot agree; but in the open, when eyes can see beyond the four walls, one becomes cognizant of other ideas in force, ideas which

are altogether different from those which adorn the philosophic mood so gracefully. Governments do not differ from individuals in having a dual personality; and though outwardly one may detect only those smiles and graces which make for international polity, under this veneer there are the primitive qualities of but slightly tamed savagery. Just why this should not be, despite the beneficent influences of civilization, despite the many restraints which we impose upon ourselves so that we may be considered civilized beings, is one of those interesting chapters in psychology which adepts in the art of elucidating the intricacies of our actions have failed to explain, and will fail so long as human nature exists in its present form. Governments and individuals being alike so far as a dual nature is concerned, we cannot expect the former to be one whit more gentle, more tolerant than the latter, and given the circumstances a slight insult is soon magnified into something that must be avenged in no gentle manner. Thus can be seen at once that such books as "Arms and Industry," excellent though they be, are written for the sake of propaganda that ill fits the vagaries of governments controlled, as they always are, by those whose one thought may not be the Nietzschean phrase, "the Will to Power," but enough of it to warrant the resort to arms in case an affront, be it ever so slight, can be made out as a direct insult to the dignity which rests with the proper conduct of a State.

Those who are interested in the Great War and the many controversies that have overridden common sense in our Press—and who has not been moved to laughter and again to anger by the asinities of the expressions from local and foreign correspondents who have allowed their prejudices to throttle their sanity?—should read "The Case of Belgium in the Present War" (The Macmillan Company, New York). This pamphlet sets forth all the horrors of war, all those deeds, not of high valor but of fierce and unbridled animality, which are its natural sequences and which have always been thus since warfare has been the adored 'sport' of the nations. We read in newspapers that this or that side has been victorious, that some thousands of soldiers have been shot or made captive, that General So-and-So is master of the situation, that after a victory large numbers of soldiers smoked their pipes and sang jolly songs as if nothing had happened; but what we do not read, or rather what is published without large, startling headlines is the real tragedy that follows the advent of a conquering army—the stricken peasantry, the ruined towns and villages, the homeless women and children, the crazed inhabitants, the complete destruction of all that mortals moil and toil for—material comfort, health, happiness, and the common decencies. These things always obtain when a weaker state is submerged by a stronger, and no page in any recent article on the present war tells the story so poignantly as does this pamphlet which was prepared by the Belgian Delegates to the United States.

ORIGINAL ARTICLES.

THE VALUE OF FUNCTIONAL KIDNEY TESTS IN MEDICAL CONDITIONS.

By GEORGE MORRIS PIERSOL, M. D., of Philadelphia,
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Hospital, Philadelphia.

During the last few years tests for estimating renal function have received careful attention and useful data have been accumulated. All observers along these lines have endeavored to devise methods by which (1) nephritis may be recognized before the usual clinical signs become manifest; (2) the exact variety of nephritis may be determined, *i. e.*, whether the lesions are chiefly glomerular, tubular, or both; and (3) the outcome and duration of the case may be predicted.

The first clinical and experimental work to throw much light on renal function was that of Schlayer and his associates,¹ in 1910. They produced experimental nephritis of various types in rabbits by potassium bichromate, cantharides, and uranium nitrate. In this way they were enabled to observe the effect of various substances such as water, salt, lactose, and potassium iodide in vascular, tubular, and mixed types of kidney lesions. Later similar observations were carried out on patients suffering from various clinical types of nephritis. The result of Schlayer's extensive clinical and experimental observations may be summed up as follow. *Vascular nephritis*, both acute and chronic, may be recognized by delayed lactose excretion, by oliguria and polyuria depending upon whether or not the renal vessels are sensitive or insensitive to vasodilator influences, and the normal excretion of iodides and chlorides. *Tubular nephritis*, on the contrary, is characterized by delayed chloride and iodide excretion, with a normal water and lactose output.

Subsequent experiments by numerous observers have in the main confirmed these findings, although there are some investigations that are at variance with Schlayer's results. The criticism has been made by Christian² that in too few of the cases, thus examined functionally, have the findings been correlated with subsequent histological examination of the kidneys to justify as yet complete acceptance of the significance of these tests. There seems little doubt

but that the functional tests of Schlayer do make possible the early recognition of abnormalities of renal function and are capable of indicating the progress of early kidney lesions. It is questionable, however, whether these tests are as useful in differentiating clinically the vascular and tubular types of nephritis, as they are in experimental renal disease. It is held that these tests are of less value in advanced kidney disease than in the earlier stages, since in all well-developed forms of nephritis the lesions are diffuse, and widespread changes coexist in both tubules and glomeruli.

In all forms of nephritis, both acute and chronic, certain substances are retained, accumulate in the blood, and are presumably the cause of the toxic symptoms that arise. As an aid in determining the degree of functional incapacity that exists in advanced nephritis, it has been shown of importance to detect such retention and to estimate its degree. This may be accomplished by determining the freezing point of serum (cryoscopy) and by quantitatively determining the total incoagulable nitrogen and urea in the blood. The simplified methods recently devised by Folin and Denis³ for the determination of total incoagulable nitrogen, and by Marshall for urea, have made it possible to perform these estimations in any well-equipped laboratory, and necessitate the use of only small quantities of blood (2 to 5 c.cm.), as against the large quantities formerly required by the older and more complicated methods.

It has been shown that an increased concentration of total incoagulable nitrogen and urea in the blood does not occur in all cases of severe renal disease; therefore, normal amounts of these substances in the blood do not invariably mean normal kidneys. A noteworthy increase, however, of these substances in the blood does point to serious renal involvement, and, generally speaking, the greater the increase of these substances in the blood the greater the degree of renal injury. Urea concentrations of more than 0.55 grm. and total incoagulable nitrogen in excess of 0.5 grm. per litre, together with a serum freezing point lower than -60° C. are regarded by Rowntree⁴ as of great prognostic significance, and such evidences of retention are termed by him 'cumulative phenomena'.

The above tests for the recognition of cumulative phenomena, though relatively simple, are obviously inapplicable to many cases and must of necessity be beyond the reach of the ordinary clinician. Happily, however, there has been devised a simple excretory test by which *total* renal function may be determined and which, therefore, is useful in all forms of nephritis whether early or advanced—namely, the phenolsulphonephthalein test of Rowntree and Geraghty,⁵ a test which has rightly been described by Fitz⁶ as "the most valuable single aid to the estimation of *total renal* function which is known at present." By much painstaking study the authors of this test have adequately demonstrated that the quantity of

phenolsulphonephthalein, eliminated by the kidneys in a given time, varies in direct proportion to the degree and severity of renal involvement.

The test is easily and quickly carried out, is accurate, and is devoid of all possible harm to the patient. It depends upon the fact that 'phthalein is a dye which is eliminated practically entirely through the kidneys and is absolutely nontoxic. Although the point is not settled, it is probable that in the main, phenolsulphonephthalein is largely excreted by the tubules. This action, however, is not sufficiently selective to make it possible to determine accurately by means of 'phthalein excretion the pathological type of nephritis, as may possibly be done in early cases by Schlayer's tests. 'Phthalein is useful as a means of recognizing an impairment of *total* renal function.

This 'phthalein test has been extensively employed during the past year in my medical service at the Episcopal Hospital in all cases in which diminished renal function was suspected. The technique of the test as employed was as follows: A solution of 6 mgrm. of 'phthalein to 1 c.cm. of salt solution was used. This was injected intramuscularly. All the urine secreted was then collected at the end of one hour and again at the end of the second hour. The urine was either collected by catheter or was voided, the latter method being usually used. The urine was then rendered alkaline by 2 per cent. sodium hydroxide solution, and the percentage of 'phthalein estimated by comparing specimens of the urine with the standardized tube of the Dubosc Colorimeter.

Under normal conditions 40-60 per cent. should be recovered in one hour and 60-80 per cent. at the end of two hours. In our experience, even in apparently normal individuals, the readings are not as a rule as high as these.

The excreting capacity of the kidneys has also been tested by the use of other dyes, such as indigocarmine, rosaline, and methylene-blue, but none of these substances has been found as generally useful or accurate as has phenolsulphonephthalein.

Although the 'phthalein test has been largely used by numerous observers, and reports as to its value are generally favorable, it may be of some profit to consider the results obtained from the application of this functional test to medical cases. The usefulness of the test is perhaps best shown by briefly citing cases illustrative of certain types of disease in which the kidneys were more or less involved.

As might be expected, the most marked impairment of 'phthalein excretion was encountered in acute uremia, indeed in some cases this deficiency amounted to absolute suppression. This was demonstrated in the case of a woman, aged thirty-one, who was admitted in a semi-stuporous condition. Her systolic blood-pressure was 200,

diastolic 145, the heart was hypertrophied, and the urine contained a cloud of albumin, but no casts. It did, however, contain some acetone and diacetic acid. There was absolutely no excretion of 'phthalein. Six weeks before admission she had complained of some dyspnea and edema of the legs. Four days before admission she had had a convulsion followed by unconsciousness for three hours and by a slight hemiplegia. A few hours after coming to the hospital she became comatose, had several general convulsions, and died. This case is of interest because of the acidosis that was present, in view of the fact that some observers have held that certain of the toxic symptoms of uremia are the result of acidosis.

The prognostic value of the test was well shown in a case of delirium tremens occurring in a middle-aged man. When first admitted he showed no noteworthy urinary findings except a cloud of albumin and a few hyaline casts, and the urinary output was normal. Several days later, although his delirium tremens was better and the urinary condition unchanged, the 'phthalein test showed that no dye was eliminated. Repeated tests confirmed this observation, and an unfavorable prognosis was given. One week later although the man seemed improved, the urinary output lessened, more albumin appeared in the urine, the 'phthalein test continued to show an absence of all dye output and the patient promptly succumbed in uremic coma.

Another fatal case of uremia, observed in a woman aged forty-two, gave surprisingly opposite findings. Two days before admission she had been seized with vertigo followed by a general convulsion. When brought to the hospital she was exceedingly excitable. There were no palsies. The day after admission she had a slight convulsion followed by marked drowsiness; the following day she had a general convulsion from which she lapsed into coma, followed by death. Her urine contained a trace of albumin and a few hyaline casts. Her blood-pressure was systolic 145, diastolic 110. A lumbar puncture revealed bloody cerebrospinal fluid under considerable tension. Her heart was not much hypertrophied. Her 'phthalein excretion, however, was 69 per cent. for two hours, although at autopsy, in addition to a cerebral hemorrhage, the marked red, granular, contracted kidneys of chronic interstitial nephritis were found.

Pathologically there was no doubt as to the existence of chronic interstitial nephritis, yet the 'phthalein excretion was about up to normal. This case resembles somewhat the case reported by Austin and Pepper⁷ in which a nephritis associated with edema existed, but in which the 'phthalein was 67 per cent. for one hour and total incoagulable nitrogen normal, but the chloride output was somewhat delayed. Baetjer⁸ has more recently reported 4 similar cases.

In the above case the entire absence of edema suggested that the chloride output was probably normal, but the absence of any tests save that for 'phthalein excretion makes it impossible to arrive at any accurate idea as to the functional state of the kidneys. The existence of cases of marked nephritis with kidneys hyperpermeable to 'phthalein must not be lost sight of.

The majority of cases of chronic nephritis of all kinds showed, in addition to the usual urinary and cardiovascular phenomena, a persistently low 'phthalein output throughout the entire period of observation regardless of whether the cases ended unfavorably or were improved. For example, in one, a man aged sixty-six, who died as the result of a hemorrhage incidental to a co-existing portal cirrhosis, the 'phthalein at the end of two hours always ranged from 23 per cent. to 15 per cent. In a man aged fifty-two who had undoubted chronic interstitial nephritis with a blood-pressure of systolic 185, diastolic 105, in spite of marked subjective improvement, 'phthalein excretion was 27 to 31 per cent.

Several individuals of middle age or over have come under observation, who, in spite of definite clinical signs of chronic nephritis, have consistently shown a 'phthalein excretion almost up to the normal. In one, at the end of two hours, it was 48 per cent.; in another, 50 per cent.; in a third, 64 per cent.; and in a fourth, 52 per cent. Such cases as these make it evident that no one test of renal efficiency should be depended upon solely, and that it is impossible to diagnose the presence of nephritis from the 'phthalein test alone. Unless it be associated with a careful general examination and other clinical data, the 'phthalein test is of little value. In these cases of clinical nephritis with good 'phthalein output, other functional tests, such as the estimation of blood urea and total non-coagulable nitrogen, must also be performed if we hope to arrive at an accurate conception of the status of the renal function.

A group of cases frequently encountered, generally termed cardio-renal, in which a variety of cardiac, vascular, and renal conditions coexist, often show, when they first come under observation, alarmingly low 'phthalein excretion. Under suitable treatment, not infrequently the urinary findings improve, and coincidentally the 'phthalein output increases up to or almost to normal. In such cases the renal condition is largely secondary to the condition of the circulation. Such a case was observed in a man, aged fifty-eight, who was admitted complaining of dyspnea and edema. His heart sounds were poor and his heart somewhat dilated, and the urine contained a little albumin. The first 'phthalein test showed only a faint trace of the dye at the end of two hours. Twenty days later, the patient having experienced marked subjective improvement, the 'phthalein excretion had risen to 31 per cent. in two hours. In these cases the test is of value as a means of determining the degree of

actual kidney involvement and how far the cardiac insufficiency is responsible for the conditions present.

In acute nephritis this functional kidney test shows a fairly consistent decrease in the elimination of the dye. Two cases have been observed in which an acute nephritis was engrafted on an old kidney lesion. Both cases were in men in early adult life; both from their histories and physical examinations gave evidence of pre-existing chronic nephritis. In one, in whom on admission the urine contained 3 grm. per litre of albumin, casts, and red blood cells, the 'phthalein was 11 per cent. After a week there was decided improvement in the urinary findings and the 'phthalein had risen to 22 per cent. In the other, the 'phthalein was 17 per cent. on admission, 19 per cent. a few days later, and finally increased to 21 per cent.

In the majority of acute infections the 'phthalein excretion has been but little below normal or even increased. In one typhoid patient with a trace of albumin and a few casts, the 'phthalein was 42 per cent.; in another it was 49 per cent. One case of typhoid fever that terminated fatally from profound toxemia, showed a 'phthalein excretion of 85 per cent. about one week before death. Another, in whom undoubtedly a nephritis existed, as evidenced by a heavy cloud of albumin and casts, had a dye output of 39 per cent.

In lobar pneumonia the phenolsulphonephthalein elimination was found to be 48 per cent., 65 per cent., and even as high as 70 per cent., in spite of the presence of albumin and casts.

In acute articular rheumatism, 'phthaleins of 48 per cent. were met with, and in a fatal case of pulmonary tuberculosis with a persistent albuminuria but no casts, a 'phthalein of 42 per cent. occurred.

It would seem that in the main the 'phthalein excretion is an uncertain factor in many of the acute infections in which the functional activity of the kidneys undergoes such rapid variations and in which the permanent renal damage is usually slight. Given a case, however, in which the urinary output is falling and in which 'phthalein and other functional tests show persistently diminished excretion, serious kidney failure should be anticipated and combated.

The test was of prognostic value in cases in which an irritant poison had been ingested. In a case of creolin poisoning in a young woman, the urine, the day after ingesting the drug, contained albumin, and the 'phthalein elimination was only 15 per cent. in two hours. The urine promptly returned to normal, and within a week the patient was discharged cured.

In one case of bichloride of mercury poisoning in a man of twenty-eight, who swallowed one-half of a 1½ gr. bichloride tablet, the urine showed a trace of albumin and a few casts, but the

'phthalein was 49 per cent. and the patient recovered. In another case, however, in a woman, aged twenty-five, who had taken a large dose of bichloride, on admission the urine contained a trace of albumin and the 'phthalein was 30.5 per cent. The following day there was a heavy cloud of albumin, casts, and red blood cells, and the 'phthalein output fell to 17 per cent. For the next week the urine contained 0.5 gm. per litre of albumin, casts, etc., and the 'phthalein was zero. For the next three weeks this patient's urine was somewhat better, the quantity eliminated was much increased, but the 'phthalein excretion continued at zero, or at best showed only in very faint traces. The unfavorable termination of the case bore out the grave prognosis which for some weeks had been indicated by the lack of 'phthalein excretion.

A case of iodine poisoning in a young girl also gave interesting 'phthalein findings. On admission the urine was normal and her 'phthalein 68 per cent. Ten days later the urine contained a trace of albumin, but no casts, and the dye output had fallen to 27 per cent. On discharge some days later, her urine was again normal and her 'phthalein was up to 47 per cent.

In decompensation from valvular or primary myocardial disease, varying grades of chronic passive congestion of the kidneys may result and the urinary picture may closely simulate a true nephritis. In such cases the 'phthalein test is of value as it enables one to obtain an approximate idea as to how much actual renal involvement exists. Our experience corresponds in the main with the statement of Rowntree,⁹ that in chronic passive congestion of the kidneys, due to failing compensation, the 'phthalein excretion is generally unexpectedly good. In a series of cases of chronic endocarditis it averaged between 43 and 58 per cent. At times the excretion may be alarmingly low, purely from a congestion; as in one case in which it was only 7.5 per cent. in two hours, and the urine contained much albumin and many hyaline casts. At the end of ten days the urine was absolutely normal and the patient had subjectively recovered. In another case of passive congestion, the 'phthalein excretion at first was 32 per cent., but in two weeks had risen to 50 per cent.

From our own experience, as well as from the observations of others, certain conclusions in regard to the utility of the phenolsulphonaphthalein test in medical cases seems warranted.

1. As a method of readily and accurately determining *total renal* function, the 'phthalein test is superior to any other single functional test, although it gives little or no information as to the kind of kidney lesion or the part of the kidneys most involved.

2. An accurate and reliable conception of the functional capacity of the kidneys cannot be arrived at by depending upon any single test. Conclusions of value can only be drawn when the condition

of 'phthalein excretion is taken in conjunction with a complete clinical survey of the case, and even then many conditions will arise about which exact knowledge can only be gained by supplementing the 'phthalein test by other excretory tests and a determination of 'cumulative phenomena'.

3. In our hands chronic interstitial nephritis has generally shown a persistently low 'phthalein output, although cases do exist in which a normal or almost normal 'phthalein excretion is found. Even an acute uremia may show a good 'phthalein elimination.

4. In cardiorenal cases and in cases of cardiac decompensation, the 'phthalein test furnishes valuable data as to which factor is the dominant one, the heart or the kidneys.

5. In acute infections the 'phthalein output is usually fair.

6. In acute irritant poisoning cases, the 'phthalein test will give early evidence of serious kidney involvement.

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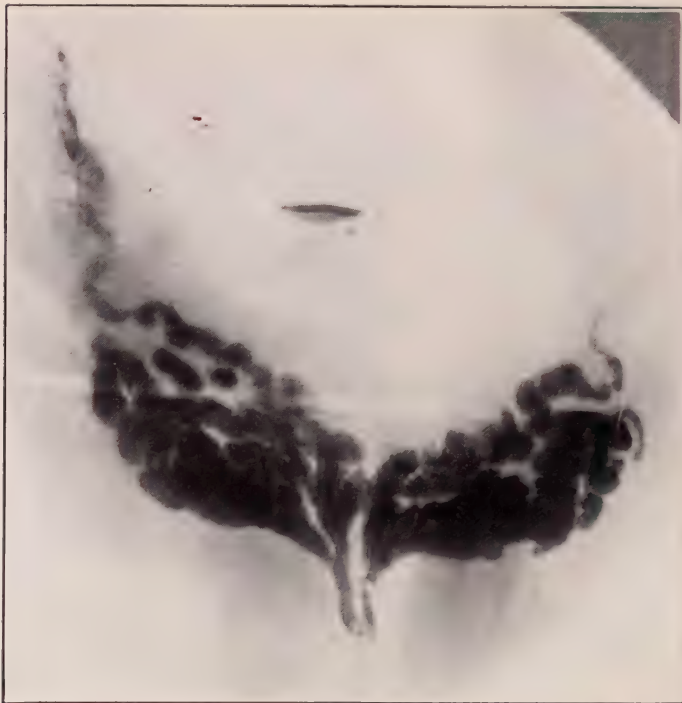


Fig. 1.—Seminal vesicles, vasa deferentia, and ejaculatory ducts injected with collargol. Autopsy specimen. Note the extreme complexity of the ampulla of the vas, the tortuous and branching lumen of the seminal vesicle, and the many small diverticula springing from it. These organs are microscopically normal. The structure of the seminal vesicle is clearly demonstrated. Contrast with Fig. 2.



OBSERVATIONS ON THE SEMINAL VESICLES.*

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The importance of the seminal vesicle from a clinical and pathological standpoint has become great in recent years. In the not distant future we can be more dogmatic about certain aspects of the question. At present we may be said to be feeling our way with x-ray, knife and microscope.

The trails first blazed by our colleagues Fuller and Belfield have inspired others to careful investigations which have yielded interesting and important results. The physiology of the seminal vesicle is now fairly well known, thanks to the work of Walker, Namba, Fuerbringer, Huet, Steinach, de Bonis and others. It has long been known that the seminal vesicle acts as a reservoir or resting place for spermatozoa as they come up from the testicles. It is a matter of ordinary clinical experience that if the normal vesicles are carefully massaged myriads of active spermatozoa may be expressed. Fuerbringer in 60 cadavers found spermatozoa in the seminal vesicles in 80 per cent.; whereas Schlemmer found them present in 89 per cent. of 156 autopsy subjects.

That the seminal vesicle has a secretion of its own and that this secretion is almost a *sine qua non* of procreation has been shown by the work of Steinach, and more recently by Walker. Both these investigators, working with white rats, showed that extirpation of the seminal vesicles alone caused a marked decrease in the high percentage of fertility common to these animals. Walker further showed that the secretion of the seminal vesicle of the rat is a very complex substance, that it contains histones and some of the higher proteins, and that the spermatozoa of these animals are immediately clumped when mixed with the vesicular secretions. He also demonstrated that this phenomenon does not occur in guinea-pigs.

Huet's experimental work has shown not only that bacteria are present in the secretion of the seminal vesicles of healthy animals, but also in animals dying of acute sepsis the specific organism is to be found in this secretion. The seminal vesicle may thus be looked upon not only as a reservoir for spermatozoa, and a secretory organ, but also as an excretory organ. If we are to regard as sound Belfield's conclusions that the testicle and epididymis are or-

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gans of excretion, corresponding to the kidney and its ureter, then we must regard the seminal vesicle in the same light, for after all it is but a complicated offshoot of the vas deferens, essentially the same, from an embryological point of view, as the latter structure and the epididymis.

The experimental investigations in animals by de Bonis throw much light on the activities of the seminal vesicle and his observations agree in the main with what clinical data we have. He finds that the vesicles develop rapidly at the age of puberty, decrease in activity during hibernation, secrete freely during the rutting season and after castration. The secretion of these organs arises from the activity of the cells lining their cavities. The process of secretion begins in the nucleus while the cytoplasm swells with liquid. The granules and plasmosomes pass into the cytoplasm, advancing progressively toward the border of the cells and by rupture this secretion passes into the glandular acini. At different ages the cells present a different appearance. At birth the glandular structure is very rudimentary, while at sexual maturity the secretory activity attains its maximum. After castration there is a notable decrease in glandular secretion even if complete atrophy does not occur, and it has been shown that the injection of testicular extract in castrated animals does not at all excite the secretion of the seminal vesicles.

The extensive investigations of Namba have shown also certain pigment granules of the nature of lipoids, in the muscle and epithelial cells. What their function is seems to be unsettled. Namba has also shown the presence of large amounts of elastic tissue in the seminal vesicles. These fibres are always to be found in the basement membrane surrounding the glandular acini and to a certain extent it runs up into the numerous villi which protrude into the glandular cavities.

So much for the work of others. The valuable operative lessons taught by Fuller, and the interesting clinical observations of Belfield are too well known to be dwelt upon here. Our own investigations have substantiated in man many of the findings of others in animals as well as in the human. In addition we have brought to light certain facts not hitherto recorded.

The presence of elastic tissue in the normal vesicle has been readily shown. It is relatively large in amount, situated almost wholly in the subepithelial tissues with fairly constant prolongation into the villi of the gland cavities, and in certain normal cases has been seen in minute quantities scattered irregularly through the muscular walls. In disease, in the presence of considerable sclerosis, this elastic tissue seems to be generally decreased in amount and is irregular in its distribution. On the other hand, certain sections have shown here and there bundles of elastic fibres far greater in size than any which we have seen in a normal specimen.

The connective-tissue of the seminal vesicle has not received much attention from others. We have studied it carefully in health and disease. In infants it is relatively scanty, but like the elastic fibres it seems to lie largely in the subepithelial tissues, although to a greater extent than elastic tissue, it permeates the muscular walls. In the normal adult vesicle its presence is well marked and it is to be seen in some instances, like elastic tissue, running into the glandular villi. Infection of the seminal vesicle seems to result invariably in the deposit of very large amounts of connective-tissue. In some specimens, with long standing infection, the walls are composed of but little else than dense fibrous tissue with here and there a few atrophied muscle bundles. It is the contraction of this scar tissue and the subsequent obliteration of all or portions of the glandular cavity which we find in some of the specimens with a history of infection dating back for many years.

Dissection of numerous specimens at the autopsy table, together with our operative experience, has shown that this fibrous tissue does not confine itself alone to the body of the seminal vesicle. In many of the specimens we have found these organs embedded in a dense cake of plastic exudate, always most marked at the prostatic border and obliterating entirely the sulcus between prostate and vesicles and between the vesicles themselves. It is this deposit of scar tissue which we feel in the living by rectum and it is this which at operation often makes the exposure, to say nothing of the excision, of the vesicles a matter of exceeding difficulty. It is this which also prevents the removal of the vesicle alone apart from the vas deferens. Separation of these structures under these conditions would be an impossible procedure.

We have nowhere seen mentioned the finding of nerve fibres in or near the seminal vesicles. It is well known that these organs are supplied and surrounded by fibres of the sympathetic nervous system. We have been fortunate enough to meet with these nerve filaments in cross section in one or two specimens, demonstrating very well not only their presence and size, but also their situation in the tissues immediately surrounding the vesicle.

Many observers have reported their bacteriological findings from the contents of the vesicular cavities. Picker has shown the gonococcus, Völcker the pneumococcus and others have shown staphylococci and streptococci. We have seen no mention made of the finding of the *B. Coli*, but we are convinced of its presence in certain cases.

In several autopsy specimens and at operation in a few cases we have taken cultures of the vesicular contents. All have been sterile. Finally, it occurred to us that the situation in the seminal vesicle might be like that in other organs, as recently described by Rosenow, of Chicago. This investigator, using an ingenious tech-

nique, has demonstrated the streptococcus and other organisms in the thyroid gland and elsewhere. The contents or fluid of the tissues gave a sterile culture, whereas the tissues themselves gave a positive result. In view of this work, we have submitted the seminal vesicle from one patient with acute joints and a fairly recent gonorrhea to such an examination. This was kindly made for us by Dr. Hugh P. Greeley, of Boston, who has done a considerable amount of work along this line and to whom we acknowledge our gratitude. Dr. Greeley found in the specimen mentioned an intramural organism, an unknown bacillus, corresponding in many ways to the bacillus of Ducrey. Incidentally the culture of the secretion from the vesicle was sterile. What the organism is or what part it plays in the lesion of the vesicle we are unable to say. It is at least an interesting discovery and one that should lead to exhaustive investigation of the same nature. If substantiated it may clear up some of our problems of infection.

Testut has observed clinically, and de Bonis experimentally, that after castration the vesicle atrophies. We can bear out their statement by a case seen post-mortem. The right testicle had been removed for some unknown cause years before. At autopsy the seminal vesicle on that side was nowhere to be found, its site being occupied by a small band of fibrous tissue. The vesicle on the opposite side was present and normal in every respect.

In connection with this it is of interest to note the findings in a case operated upon by Dr. Cabot. There was a well-developed arthritis of long standing, an acute gonorrheal epididymitis on one side and an undescended testicle on the other. The vesicles were exposed in the usual manner, and that on the side of the undescended testicle was quite as well developed, also as badly diseased as its fellow. Cryptorchidism therefore would seem to be without influence on the seminal vesicles.

In the belief that the seminal vesicle is an excretory organ we have searched, not only in its walls but in its secretion, for the *spirochæta pallida* in two cases of congenital syphilis. Our efforts have proved futile even though in both these cases the *spirochæta* was easily found in almost every other organ of the body. We believe our failure has been one of technique and further attempts are to be made. If the *spirochæta* can be demonstrated in the seminal vesicle of an individual with uncured syphilis, may it not explain, at least in part, the transmission to the offspring of the disease without obvious infection of the mother?

One of our chief objects has been to establish a more accurate method of diagnosis than simple rectal examination. In many cases this will show the dilated, indurated, tender vesicles which are so characteristic. In other patients no definite abnormality of the vesicles can be made out, owing perhaps to the deposit of an exten-

sive cake of plastic exudate overlying and obliterating prostate and vesicles; perhaps to the small size or difficulty in reaching the organs in question. Massage may or may not improve the arthritis and the general toxemia from which the patient suffers.

How are we to know whether the focus of infection lies in the seminal vesicles? It is our belief that the *x*-ray will solve at least some of these difficult problems. In order to know what is abnormal we must know the normal, and but little work has been done along this line.

We have removed the organs from several autopsy cases, injected the seminal vesicles with collargol, taken a radiogram, noted carefully the appearances of the shadow and have compared the picture with the microscopic findings. Where the microscopic sections of these organs were normal, there was no gross evidence of disease. One such specimen obtained post-mortem shows a very different picture. Whereas in the normal cases one can readily follow the tortuous tube of the seminal vesicle throughout most of its extent (Fig. 1), in the pathological specimen one sees a distinct dilatation of the cavity. So extensive is this that we see, not the various convolutions of the lumen, but only a dense mass of injection fluid due to the overlapping of one dilated convolution upon the other (Fig. 2). Microscopically these vesicles were in a state of subacute inflammation, the walls were thickened and the cavities much dilated.

The *x*-ray shows also very prettily in the case of a child three months old the simplicity of the cavity of the seminal vesicle, the almost complete absence of the ejaculatory ducts and the small size of the organs.

We have also injected one or both vesicles in many cases before or in anticipation of operation. In cases which unquestionably needed operation we have adopted this procedure in the hope of increasing our knowledge of the appearance of the pathological vesicles; in cases of doubt we have injected the organs in the hope of eliminating that doubt by the picture obtained. In some respects these clinical radiograms have compared closely with those made on autopsy specimens, but in the former series we have injected no case known to be normal. Thus in the living it is not feasible to make the comparisons which are possible in the dead. Furthermore owing to the difficulties of such an injection in the living and on account of the presence of other intervening substances and organs, the best of radiograms is poor as compared with those on the cadaver. However, on the whole, the results are quite satisfactory and thus far have pretty constantly borne out our belief that it is possible to make a diagnosis of a diseased vesicle by collargol radiograph.

One case so injected had all the evidences of disease of the seminal vesicle except that these organs did not feel pathological. The *x*-ray

shows a shadow quite unlike those of definitely diseased organs, and subsequent events have shown that the pain from which the patient suffered was due, not to vesiculitis, but to chronic appendicitis with adhesions.

A valuable lesson has been taught us by the *x*-ray pictures. In those of the autopsy specimens especially, and to some extent in the clinical cases, one can see the extraordinary complexity, not only of the seminal vesicle but also of the vas deferens at its ampulla. Some of the seminal vesicles have budding from their walls diverticula of considerable size, connected with the main organ by a narrow tortuous neck (Fig. 2), and found microscopically to present the same picture, whether diseased or healthy, as the seminal vesicle itself. Examination of the ampulla of the vas deferens shows an even greater complexity of lumen and a larger number of diverticula (Figs. 1 and 2). In the presence of these peculiarities of each structure is it not easy to see why infection once started in vas or vesicle is so persistent, why massage may be so inadequate, and why excision, rather than drainage by multiple incisions, should be the operation of choice? How is it possible in the presence of some of these large and unsuspected diverticula to effect a cure by such methods? An infected diverticulum, left untouched, as it surely would be by simple incision of the vesicle, is perfectly capable of carrying on the work of the vesicle itself in the production of symptoms.

To sum up, our investigations with the microscope, the knife and the *x*-ray have shown certain definite facts about the seminal vesicles. We have found that if one organ is diseased so also is its fellow; that during the early stages of infection of the vesicle, dilatation of its cavity occurs, owing either to a cessation of its normal peristalsis or to an obstruction of the ejaculatory duct or to both. Later on this is followed by a deposit of more and more scar tissue in and around the vesicles until they become lost to rectal palpation, and when dissected are found to be enormously thickened and with cavities shrunk and in some places almost obliterated.

But we have not yet touched upon the important question of the condition of the prostate and of the ejaculatory ducts in the presence of pathological seminal vesicles. We have every reason to assume, on clinical grounds at least, that infection and morbid changes in the latter accompany similar conditions in the former. This being the case it will explain some at least of our failures to cure chronic arthritis by vesiculotomy and even by vesiculectomy unless the prostate is also removed. We must not forget the brilliant work of the late Dr. Alexander on the pathology of the prostate, nor should we forget to apply his teachings in the cases with which we are dealing.

In closing it seems fitting to say a few words about the more or

less immediate results of vesiculectomy. All our cases have been operated upon too recently to draw definite conclusions. With one or two exceptions these patients have relapsed after operation; in some, infected joints, formerly quiescent, have exacerbated; in others fresh joints have become involved. In most, so far as we know, such reinfections have been short-lived and not serious. Such results bring up the question just touched upon of the feasibility of removing the prostate or at least draining it by free incision. They also show, statements of other operators notwithstanding, that although radical measures for the relief of vesiculitis may and undoubtedly do produce a cure in the long run, the patient's path is not at once strewn with roses.

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CLINICAL NOTES ON HYDRONEPHROSIS.

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By the term hydronephrosis is designated a condition characterized by ureteral obstruction with consequent mechanical distention of the renal pelvis. The ureteral constriction may be due to a great variety of causes which may be grouped under two general headings—namely, congenital and acquired. It is my purpose to take up for discussion the form of hydronephrosis which is caused by obstruction to the upper ureter largely dependent upon congenital conditions. This type of hydronephrosis is to all practical purposes a clinical entity and is called intermittent hydronephrosis.

The subjective symptoms accompanying intermittent hydronephrosis are, as a rule, not of definite localizing nor diagnostic value. However, there are three features which are peculiar to this condition and which are worthy of note, *e. g.*, (1) the early adult stage, (2) the periodicity of attack, and (3) the absence of urinary symptoms.

The Early Adult Stage.—In the 116 patients with intermittent hydronephrosis that have been operated on in the Mayo Clinic, the average age when symptoms first appeared was twenty-one, the majority showing their first symptoms soon after attaining their full growth. This would tend to place the character of the obstruction on an anatomical basis.

Periodicity of Attack.—Practically in all the cases the appearance of the attacks, while variable, had a certain degree of regularity. The length of the intervals between the attacks usually shortened as the condition progressed and in the intervals the patients were free from symptoms. A constant dull pain was noted only in the latter stages of the disease and then usually in cases of secondary infection.

The Absence of Urinary Symptoms.—Although hydronephrosis may have been present many years, but few patients complained of urinary symptoms; their absence is of value in differentiating the condition from pyonephrosis and from lithiasis. The presence of gross pus was noted in 12 patients (10 per cent.). The absence of microscopic pus was noted in 16 patients (14 per cent.). The localization of the pain, while referred more often to the kidney area, may be referred to the anterior upper quadrant or even as low as the umbilical level. The differential diagnosis of hydronephrosis from

disease in the gall-bladder and appendix is frequently impossible from subjective symptoms alone. Of the 116 cases, 51 (44 per cent.) had previous abdominal operations elsewhere for relief of the abdominal pain.

Objective Symptoms.—On physical examination the only data of value would be in the determination and identification of tumor in the lateral upper abdomen. Our clinical records show that tumor was definitely palpable in the abdomen in 38 cases (32 per cent.). In determining the existence of abdominal tumor, however, there are many possible sources of error, among which may be considered the following:—

1. Tumors of the surrounding organs so frequently simulate renal tumor in position, form and consistency that it is quite impossible to differentiate them by means of palpation alone.

2. Renal tumor may be very uncertain on palpation when the kidney lies high and in a fat abdomen. It is frequently astonishing to find so large a tumor at operation when on palpation an enlargement could not be determined or was considered questionable.

3. Kidneys otherwise normal are occasionally so large that they simulate tumor on palpation. This is particularly true in thin patients and in the low-lying kidney.

The typical large hydronephrosis which causes tumor in the kidney area is usually smooth and cystic and more or less movable. Occasionally, however, such a tumor may on palpation appear to be solid, irregular or fixed. Its nature would further be concealed if it appeared without any previous subjective pain.

The clinical identification of abdominal pain and of tumor referred to the upper lateral abdomen by means of subjective and objective data is so uncertain that we are usually compelled to refer to cystoscopic examination. The diagnosis of the intermittent hydronephrosis is largely a problem of cystoscopic technique. Not alone is the diagnosis gained by this means, but the functional capacity of the affected kidney, the extent of the distention and the condition of the remaining kidney may also be ascertained. The data to be gained on cystoscopic examination are those derived by means of (1) inspection, (2) the ureteral catheter, (3) the overdistention and (4) pyelography.

Inspection.—With early hydronephrosis, the data to be gained on inspection of the ureteral meatus would be of little or no value. When, however, the condition is advanced, we may expect to find atrophy of the muscle around the meatus. Further, with the decrease in renal function, there would be comparative diminution of secretion from the affected side. With secondary infection, purulent urine may be seen.

Ureteral Catheter.—Although obstruction to the ureteral catheter is usually met with, in early hydronephrosis little or no obstruc-

tion may be noted. With advanced hydronephrosis, however, there will be obstruction in practically every case. By means of direct catheterization, the character of the obstruction may often be felt at or just below the ureteropelvic juncture. The obstruction, even though quite definite, will, after more or less manipulation, usually permit the catheter to glide by.

When the catheter has entered the pelvis of the kidney, the next point of importance is the demonstration of the presence of residual urine. Its presence is revealed by a rapid flow of urine beyond the point of constriction without the usual peristaltic hesitation. The amount of residual urine will vary with the degree of distention. Care should be taken, however, to differentiate this rapid flow from the hypersecretion seen from reflex nervous irritation. The latter may be recognized when the flow is rapid from *both* kidneys. The residual urine with a hydronephrosis of considerable size is usually of low specific gravity and pale.

The amount of residual urine may sometimes be ascertained by suction by means of a syringe and frequently several ounces of fluid may be withdrawn from the pelvis by this method. Care should be taken, however, that the fluid is not drawn up the ureter from the bladder.

Overdistention Method.—That the capacity of the renal pelvis can be estimated by measuring the amount of fluid injected necessary to cause pain was first suggested by Kelly. This method has received wide recognition and is still regarded as a valuable method of diagnosis in hydronephrosis, though recently its limitations have been recognized. Its greatest value is in the diagnosis of moderate degrees of hydronephrosis, of distentions with the capacity of an ounce or more. With a small hydronephrosis, however, the method has not proved to be of accurate value. With a hydronephrosis of a capacity of from 15 to 30 c.cm., great difficulty would be met in differentiating it from the large normal pelvis. Various observers have noted the possibility of injecting between 15 and 30 c.cm. of fluid into a large normal pelvis. This does not necessarily indicate that the renal pelvis itself has such a capacity; a part of so large an amount of fluid will undoubtedly distend the upper ureter around or above the catheter as well, which is capable of considerable distention normally before pain is caused. It would be quite impossible to estimate the amount of fluid in the ureter and pelvis separately. Therefore, if 25 c.cm. were injected before causing pain, we should be unable to determine whether we were dealing with a pelvis of 7 c.cm. normal capacity dilated to three or four times its normal size, or with a normal pelvis and ureter of 25 c.cm. capacity.

The similarity of pain caused by overdistending the renal pelvis with that originally complained of by the patient may occasionally be of value. If the patient complains that the overdistention pain

is similar to the pain felt before, this fact cannot be given much reliance; if, however, the patient is quite definite in saying that the pain is different from the original pain, the symptom may be of differential value.

Pyelography.—Rendering the outline of the pelvis opaque to the x-ray by means of an injected opaque solution, a method known as pyelography has recently been employed to advantage. It has been proved to be of greatest value in the diagnosis of early hydronephrosis. It may be of value also in determining the existence, degree and character of moderate hydronephrosis, but it is distinctly contraindicated in the diagnosis of large hydronephroses.

Early Hydronephrosis.—Probably the first deviation from the normal to be noted with early hydronephrosis is a flattening of the terminal irregularities seen in the normal minor calyces. Accompanying the shortening of the minor calyx there is usually a broadening of the entire calyx, particularly at its base. Following soon or accompanying these changes will be noted an increase in the size of the true pelvis. With the increase in size of the pelvis, a shortening or flattening of the papillæ projecting between the calyces is noted. The greatest difficulty occurs in differentiating early hydronephrosis from the large normal pelvis, since not infrequently the true pelvis of a normal kidney is of unusual size. However, if on close inspection it is seen that the terminal irregularities of the minor calyces are well preserved, and there is no broadening of the base of the calyces, hydronephrosis would be definitely excluded. The changes from the normal must be well marked in order to identify the hydronephrotic condition. When any doubt arises as to whether a pelvis is abnormally enlarged, it may be of value to make a pyelogram of the pelvis of both kidneys and compare the outlines. As a rule, an unusually large but otherwise normal pelvis occurs bilaterally. With the outline of the pelvis on one side appearing two or three times as large as that on the other, we would have corroboratory evidence of pathologic distention.

Moderate Hydronephrosis.—With increase in the size of the hydronephrosis, we first note a marked broadening of the entire calyx. The terminal irregularities are to a great extent lost entirely if the calyx is fully distended. Not infrequently with the distention of the calyx there is an accompanying shortening. This may be present to such an extent that the site of the former calyx is designated by irregular indentation in the otherwise rounded contour of the true pelvis.

Accompanying these marked changes in the outline of the calyx, marked increase in size of the true pelvis may also be noted. This is seen distended with a smooth, well-rounded outline along its free border which differentiates the mechanical from the inflammatory

distention. This increase in size of the true pelvis may be out of proportion to the changes in the calyces. With increase in size of the true pelvis we also note a marked shortening of the papillæ which normally project between the calyces into the pelvis. The papillæ may become so flattened as to be practically effaced.

A point of interest in the diagnosis of hydronephrosis of a limited or moderate degree is the change seen in the angle of insertion of the ureter. The course of the normal ureter as it leaves the pelvis varies considerably, depending upon the relative position of the kidney and the first segment of the ureter. With a low-lying kidney, otherwise normal, the ureter may be seen to enter the pelvis by a circuitous route. However, when there is evident acute angulation near the ureteropelvic juncture with a distinct increase in the size of the pelvis and definite changes in the outline of the calyces, the anomalous course of the ureter may be of corroboratory value in demonstrating hydronephrosis. An anomalous insertion of the ureter without evidence of dilatation in the pelvis could not, however, be regarded as the cause of any subjective symptoms.

An element which may affect the general contour of the dilated pelvis is that of secondary infection. With interference of drainage from the kidney, secondary infection will frequently occur. If the infectious process actively involves the entire kidney, it may affect the general pelvic outline to a considerable extent. The entire pelvis will become irregular in outline and the calyces appear more accentuated and irregularly rounded.

Large Hydronephrosis.—The demonstration of a large hydronephrosis by means of pyelography is, as a rule, unnecessary, since its existence can usually be determined by the ordinary means of the cystoscope and ureteral catheter. However, because of difficulties in cystoscopic technique, it may be occasionally necessary to make a pyelogram in order to ascertain the exact condition present. The comparatively small amount of colloidal silver solution injected will usually be greatly diluted by the residual urine in the pelvis and the exact contour of the distention will not be demonstrated in the pyelogram. A diffuse dim shadow extending over a wide area usually indicates the extent of the pelvic distention. Not infrequently one or all of the calyces appear as well-defined, irregularly rounded areas scattered over the cortex, while the pelvic outline is scarcely visible. This may be explained by the fact that the injected fluid has remained undiluted at the ends of the partially drained calyces.

Differential Data.—In the course of a cystoscopic examination, data are frequently gained by means of the ureteral catheter which may prove to be confusing and lead one to infer erroneously the existence of a hydronephrosis. The pyelogram is of value in differentiating physiological from pathological conditions: (1) With

constriction of the ureter, not permitting the ureteral catheter to enter the pelvis; (2) with a short length of catheter and return flow on overdistention; (3) with unusual length of catheter; (4) hypersecretion.

It may be impossible to demonstrate the existence of hydronephrosis in any other way than by means of the pyelogram when the obstruction in the ureter does not permit the catheter to enter the pelvis. It is self-evident that the amount of residual urine could not be determined, nor would the overdistention method be applicable. While but a small part of the fluid injected will pass by the ureteral constriction into the pelvis, nevertheless enough will usually enter to outline the existence of a hydronephrosis.

Not infrequently an unusually short length of catheter may pass up into the ureter and, on injecting colored fluid, a rapid return flow may be seen. This may frequently occur with the normal low-lying kidney and may also be present with obstruction of the upper ureter. Further, folds of mucosa or a circuitous route of the ureter may prevent the catheter from being inserted to the fullest extent of the ureter. A fluid such as colloidal silver when injected into the ureter may pass such a physiological obstruction when a catheter would not pass. The resulting pyeloureterogram demonstrates the actual condition at hand.

Occasionally in a flaccid ureter and pelvis a soft ureteral catheter may be introduced to an unusual length and lead one to infer that it is coiling up in a dilated pelvis. The position of the catheter as well as the exact size of the pelvis may be accurately determined by means of a pyelogram. Occasionally, because of reflex irritation or from other nervous stimuli, the rapidity of renal secretion may be so marked that the urine runs in a continuous stream with little or no peristaltic hesitation. As it drops rapidly from the catheter inserted in the renal pelvis, one might easily infer that it is due to residual urine in a distended pelvis.

Etiological Data.—A pyelogram is further of considerable value in demonstrating the etiological factors present. It is of particular value in its power to demonstrate whether the obstruction is in the upper or lower ureter, whether primarily or secondarily inflammatory, whether due to change in the position of the kidney and, lastly, not infrequently may point out the nature of the obstruction, particularly when subsequent to a constricting anomalous blood-vessel. While it is not of much practical value in determining clinically the actual cause of the constriction in the upper ureter, a contour of the hydronephrotic sac frequently has been noted peculiar to constriction caused by anomalous renal blood-vessels. The majority of anomalous blood-vessels which constrict the upper ureter enter the lower pole of the kidney, thus crossing the ureter several centimetres below the ureteropelvic juncture. In the subsequent

dilatation, the pelvis will dilate to a greater extent than the upper ureter. Consequently the general contour of the resulting sac will be pyriform. Of interest is the frequency with which an anomalous blood-vessel was found at operation to constrict the upper ureter and so cause the hydronephrosis. In a paper written by W. J. Mayo, MacCarty and the writer in 1909, it was noted that an anomalous blood-vessel was found at operation to be an etiological factor in 20 out of 27 cases of hydronephrosis. Since then it has been found not quite so frequently, but in the 116 cases it was reported present in 71 (61 per cent.).

The more usual sources of error in the interpretation of the pyelogram are those due to: (1) Technical errors in pyelography; (2) difficulty of differentiation from the normal pelvis; (3) the indefinite shadows caused by dilution from retained fluid in large sacs; (4) incomplete distention of the pelvis and ureter.

Persistence of the Injected Medium.—In cases in which the results of the examination are unsatisfactory and the existence of a hydronephrosis is doubtful, evidence of the persistence of silver solution in the urine may be of value in the diagnosis. Under normal conditions, all evidence of the silver solution in the urine should be absent in less than twenty-four hours after the injection. If the urine remains stained for several days, we have evidence of retention in some portion of the urinary tract. If a subsequent radiogram is taken twenty-four hours after the injection and the shadows of the retained injected solution are evident, the nature of the retention is apparent. This is apt to occur at the end of a calyx which cannot be drained. Occasionally it will be seen as a diffuse, dim shadow made faint by dilution in the true pelvis.

Intrarenal Hydronephrosis.—The usual hydronephrosis is characterized by marked distention of the true pelvis which is seen on surgical exploration of the kidney extending from the renal cleft as a distended, rounded sac. Occasionally, however, the distention is largely intrarenal, and in such cases, on section of the kidney, the calyces will be found markedly distended, often extending to the very limits of the cortex, while the distention of the true pelvis is largely confined within the substance of the kidney. The parenchyma of the kidney is then considerably atrophied and limited in extent. It may be rather difficult to explain the intrarenal distention of the free pelvis. Frequently, however, it is due to peripyelitis with subsequent cicatricial tissue preventing the extrarenal distention.

Hematonephrosis.—A most interesting chapter in the study of hydronephrosis is the so-called bleeding hydronephrosis. While hematuria is not commonly found with hydronephrosis, occasionally it may be a prominent symptom. With the presence of marked hematuria, the clinical data are frequently confusing. The clinical

differentiation of a bleeding hydronephrosis from a renal neoplasm may be difficult. The hematuria is usually the result of a varicose condition of the pelvic mucosa probably caused by chronic insidious infection. As a rule, such a hydronephrosis or hematonephrosis may be recognized by demonstrating the large amount of hemorrhagic residual urine in the pelvis. If a pyelogram is found necessary for identification, the outline of the hydronephrotic pelvis will readily be differentiated from the pelvic deformity accompanying other renal conditions which might cause hematuria. Hematuria with intermittent hydronephrosis was present in but 4 (3.4 per cent.) of the 116 cases.

Closed Hydronephrosis.—Not infrequently a patient may present himself because of abdominal tumor which may have appeared with little or no pain. The tumor may on palpation appear to be either cystic or firm, and may be so situated as to lead one to believe that it is a tumor of various extrarenal organs. All urinary symptoms may be absent and the urine normal. If the tumor is caused by a closed hydronephrosis the cystoscopic examination alone will reveal the true state of affairs. No secretion of urine will be noted from one meatus, while the secretion from the other will be unusually large in amount. The catheter will meet with impassible obstruction at a variable distance up the ureter. The type of hydronephrosis which goes on to complete closure occurs usually without pain. The occlusion is, as a rule, probably sudden with the kidney in a previously normal condition. Closed hydronephrosis is frequently unrecognized prior to operation and is more commonly mistaken clinically for cystic gall-bladder and ovarian or mesenteric cyst. Every doubtful tumor, particularly in the upper lateral abdomen, should have the possibility of renal involvement excluded even though the urinary data are negative.

Postoperative Course.—Of considerable interest is the course of the hydronephrotic sac following the removal of the ureteral obstruction at operation. If the dilatation has not been too great and if there is no marked degree of secondary infection, the sac may resume practically its normal contour in the course of time. This is well illustrated in a pyelogram which was taken three years after a plastic operation for hydronephrosis. At the time of operation, a hydronephrosis of 3 or 4 oz. was found. Three years later the hydronephrosis showed in the pelvis practically normal in outline with a capacity of 28 c.cm. In another radiogram recently made we had an example, on the other hand, of the plastic operation performed five years before on a hydronephrosis of approximately 4 oz. capacity and which at the present time is still dilated. The absence of objective symptoms and the character of the secretion on that side, however, show that considerable functional capacity still remains in the kidney. The pelvis remains enlarged to a variable

degree in the majority of cases of well-marked hydronephrosis following plastic operation.

In this series of 116 cases of hydronephrosis, nephrectomy was done in 84 (72 per cent.) cases; a plastic operation on the pelvis in 15 (13 per cent.) cases; and division of the ureter and nephrorrhaphy in 17 (15 per cent.). Plastic operation on a large hydronephrosis of a capacity of more than 5 or 6 oz. is usually not successful. In practically every case where nephrectomy was necessary there had been unrecognized symptoms of long duration. Had these cases been diagnosed early, even within two or three years after the beginning of the first symptoms, a plastic operation might have sufficed to restore function. The early diagnosis of hydronephrosis is greatly to be desired.

SPINAL ANESTHESIA IN UROLOGY.

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It is a fact of some historical interest that the first use of spinal anesthesia was for urological purposes. In 1885, Corning,¹ of New York, having first tried it upon a dog, injected 30 minims of 3 per cent. cocaine hydrochloride "between the spinous processes of the eleventh and twelfth dorsal vertebræ" of a man addicted to masturbation and suffering from seminal incontinence. Anesthesia of the legs and genitalia was produced. A sound was passed without pain and a urethral electrode applied without inconvenience, although previously the patient had always felt much pain during the passage of instruments. At the conclusion of his report, Corning remarks that he does not know whether or not spinal anesthesia may ever become a substitute for etherization in genito-urinary surgery.

A review of the literature of spinal anesthesia shows that in a number of clinics this suggestion of Corning's comes very near fulfilment. Dax² reports 1,500 cases, of which 168 were genito-urinary. Delaup³ reports 1,239, with 585, and Richards,⁴ of Cairo, Egypt, reports 500, with 219 upon the urogenital tract. Albarran,⁵ in 1908, and Jeanbrau,⁶ in 1911, wrote upon the use of spinal anesthesia in urology. The amount of operating done upon the genito-urinary organs in different clinics necessarily modifies the figures, but the literature affords much evidence that wherever spinal anesthesia is used, it is to a considerable extent employed in urological cases.

A complete discussion of spinal anesthesia is not within the scope of this paper. Only those phases which bear upon its use in urology will be taken up. We must first, however, establish our right to use this form of anesthesia at all. Bevan⁷ has recently said that "spinal anesthesia has little or no field of usefulness. It is dangerous, often incomplete. . . . It should be limited to an exceedingly small field." With this opinion very few surgeons who have given the method a trial would agree.

Briefly, the position of lumbar anesthesia in surgery seems to be this: the method, if carried out properly on suitable cases, has a mortality no greater than 1 in 1,000. A number of men report considerably more than 1,000 cases without a death attributable to the anesthetic. The statistics offered by various compilers vary

from one death in 200 to 1 in 1,800.⁸ In many of the cases reported as fatalities, death is clearly due as much to the wretched condition of the patient and to the operation as to the effects of the anesthetic. With any other method of anesthesia the result would have been the same. There have been reported, however, enough fatalities undoubtedly due to the anesthetic to make the use of spinal anesthesia unjustifiable in cases in which local anesthesia will suffice, or in which there exist no contraindications to a general anesthetic. These contraindications include not only organic lesions of vital organs, but external circumstances, such as the absence of a reliable etherizer, or, on the patient's part, an extreme dread of general anesthesia.

The intraspinal injection, it is true, is not always successful. In a few cases with arthritis of the lumbar spine, the needle fails to reach the canal. In other cases, the point may fail to pierce the dura, or having done so incompletely, it may slip out during the injection. These failures are almost always failures in technique, and become less frequent with greater experience. The experience of surgeons generally seems to be that in from 5 to 10 per cent. of the cases in which spinal anesthesia is attempted, the puncture cannot be made successfully or satisfactory anesthesia cannot be obtained.

The untoward effects of spinal anesthesia used in properly selected cases are really very few. Aside from the matter of ocular palsies, the nervous system is not injured. Eden, Rehn and Spielmeier (quoted by Rehn⁹) agree that although the drugs used are capable of producing degenerative changes in the spinal cords of dogs into which they are injected in large doses, in man, used in the usual doses, they have no permanently injurious effect. That the amount of drug which we use has no destructive action is proved by Babcock,¹⁰ who has used spinal anesthesia in the same person eleven times within a few years with no ill effects. Another case has been reported into whose subarachnoid space stovain was injected seven times in three weeks, through the mistaken zeal of a house-officer who used it every time he replaced a drainage tube. Riche¹¹ found that fluid withdrawn from six to twenty-four hours after the injection showed no chemical or cytological change. As for the ocular palsies, Reber,¹² in 1910, collected 36 cases from the literature. Twenty-six of these had been followed, and of them 16 had completely recovered, while 5 seemed permanent.

Headache is not an uncommon after-effect, some writers finding it in 20 per cent. of cases. It usually lasts only a day or two, and if persistent may be cured, according to Tuffier,⁶ by a lumbar puncture and the withdrawal of 10 to 15 c.cm. of fluid.

As regards the other organs of the body, the toxic effect of the drugs used in spinal anesthesia is negligible. Although these

drugs are eliminated by the kidneys, the disturbance of the latter which has been noted¹³ is always transient and seldom severe. Miller,¹⁴ studying 16 cases by the aid of phenolsulphonephthalein, found less disturbance than after ether. Albarran, Bier,¹⁵ and Cabot¹⁶ agree that the influence of spinal anesthesia on kidneys, whether healthy or diseased, can be disregarded.

Upon processes in the lung spinal anesthesia has, of course, no effect. That it does not prevent pneumonia has been demonstrated frequently. Von Mickulicz has shown that pulmonary complications occur more frequently after 100 gastric operations done under local anesthesia than after 100 done under ether. We must realize, therefore, that most of the postoperative pneumonias are due to some cause other than the anesthetic. Circulatory congestion, lowered resistance, and septic emboli are the important factors, and they are influenced far more by the condition of the patient and the nature of the operation than by the type of anesthesia. In spinal anesthesia the direct effect of the drug upon the heart muscle is insignificant. The effect of vasomotor disturbances upon the heart, on the contrary, is of the greatest importance.

When a drug is injected into the subarachnoid space, the extent of its diffusion depends upon five factors. The first two are beyond our control. They are (1) the natural diffusibility of fluids, and (2) the circulation of the spinal fluid from natural causes, such as respiration. The other three are more or less within our control. They are (3) the specific gravity of the injected solution, (4) the amount of its dilution with spinal fluid in the syringe, (5) the force with which the injection is made. A corollary to (3) is the position in which the patient is placed after receiving the injection. (For a discussion of the question of specific gravity, see Barker.¹⁷) As the solution containing the drug diffuses upwards, it paralyzes the nerve-roots which traverse the subarachnoid space. When it reaches the 4th and 5th dorsal segments, the intercostal muscles, according to Gray and Parsons,¹⁸ become paralyzed, and breathing becomes of the diaphragmatic type. If the paralysis extends to the phrenics and the external respiratory nerves of Bell, respiration fails. This catastrophe, however, occurs only rarely, and can be avoided by taking precautions against the upward diffusion of the drug. A good deal has been said about the toxic effect of the drug upon the medulla, and the respiratory and vasomotor centres situated there. Those observers who have studied the question carefully are not strongly in favor of this theory as to the cause of the changes in respiration and circulation, but a satisfactory explanation of the vasomotor phenomena in spinal anesthesia has not yet been advanced. Certainly in some cases the blood-pressure does fall, at times tremendously. We have records of a drop of 100 mm. Hg. Gray and Parsons found a constant fall, with which most

other observers agree. This fall they consider to be due to two causes, (1) the flaccidity of the muscles of the abdomen and lower limbs, which are paralyzed by the spinal injection, (2) the change in respiration from costal to the diaphragmatic type. With this change, the diaphragm, they believe, presses less strongly on the abdominal viscera, and the suction power of the thorax is diminished. Neither this explanation nor the theory of direct toxic effect upon the vasomotor centre seems satisfactory, for reasons too lengthy to be taken up in this paper. The fact remains that in a considerable number of cases, the blood-pressure shows a marked fall. This is, to the writer's mind, the most important phase of spinal anesthesia; as Morrison¹⁹ well says: "The danger incidental to spinal anesthesia lurks in the lowering of the blood-pressure." Whatever may be the cause of this fall, it is clear that we should avoid by all the means at our command any unnecessary upward diffusion of the anesthetic, and should avoid the use of spinal anesthesia in those patients whose heart-muscle is so damaged that it cannot stand a sudden, and perhaps extreme, fall in blood-pressure.

So much for the theoretical side of spinal anesthesia. Let us consider its practical application in urology.

From August 1st, 1911, to July 20th, 1914, spinal anesthesia was used just 100 times in the genito-urinary service at the Massachusetts General Hospital. It was attempted in 3 other cases, without success; in 1 case the patient was a hysterical woman; in the other 2, spinal puncture did not yield fluid. Of the 100 times the drug was injected, in 10 the anesthesia was incomplete enough to require more or less ether. In a few other cases, whiffs of ether were given for the psychic effect, although the anesthesia was good. The punctures were done by different individuals, some of whom had had very little experience with this method, and as Allen²⁰ points out, familiarity with the proceeding gives fewer failures. The method used was introduced at the Massachusetts General Hospital by Allen,²¹ Chief Anesthetist, and is elsewhere fully described by him.

The drug used in at least 80 per cent. of our cases has been tropacocain, put up in ampoules according to Doenitz' formula by G. Pohl, Schœnbaum. Each ampoule contains 1.3 c.cm. of a 5 per cent. tropacocain solution, with the addition of 0.00013 gr. suprarénin hydrochloride per c.cm. Tropacocain has been shown to be less toxic and less destructive of nerve tissue⁹ than stovain or novocain, and is the drug favored by most of those who have reported on spinal anesthesia. The specific gravity of the solution which we use has been determined for the writer by Dr. W. Denis, Assistant Chemist at the Massachusetts General Hospital, and found to be 1.0071, whereas the specific gravity of spinal fluid is estimated at from 1.003 to 1.007.¹⁷ In using this solution, therefore,

the influence of specific gravity upon its diffusion in the spinal canal can be disregarded.

The dosage has varied from 0.05 to 0.12 gm. It has seemed that the anesthesia obtained with a moderate dose—0.075 gm. (1.5 c.cm. solution)—has been as satisfactory as that obtained by larger doses. The symptom-complex consisting of nausea, vomiting, pallor and sweating, which is probably due to vasomotor paralysis, has followed this dose in some patients, and has not followed larger doses in others. Larger doses give longer anesthesia, as a rule, but the anesthesia after 0.075 gm. usually lasts for one hour. The puncture has been made between the 2nd and 3rd or 3rd and 4th lumbar vertebræ, rarely between the 1st and 2nd. From 3 to 5 c.cm. of spinal fluid are drawn into the syringe to mix with the anesthetic solution before its injection.

We have had no deaths directly attributable to this method of anesthesia, and but one case of serious collapse. This was in an arteriosclerotic old man, whose blood-pressure was only 114, to whom 0.05 gm. of stovain-Billon was given. His head was kept elevated, which may have been the reason for the collapse, for Barker found this solution to be considerably lighter than spinal fluid. The patient recovered.

The operations done under spinal anesthesia were:—

Suprapubic:	Perineal:
Partial Cystectomy, 3.	Prostatectomy, 2.
Total Cystectomy, 1.	Vesiculectomy, 4.
Cystotomy, 8.	Urethrotomy, 6.
Prostatomy, 5.	Perineal Section for Extravasation,
Prostatectomy, 31.	Periurethral Abscess, etc., 5.
	Closure of Vesicovaginal Fistula, 1.
Intravesical:	On Genitalia:
Litholapaxy, 5.	Scrotum, 11.
Cystoscopy, 16.	Amputation of Penis, 2.
Transurethral prostatic- tomy, 1.	Outside G.-U. Tract:
	Dissection of Groins, 1.

We have never attempted renal operations under spinal anesthesia, although a number have been reported in the literature. Albarran, in 1908, reported 14. Traction on the kidney pedicle causes pain, according to one observer. It has been found that although sensation in the superficial layers is lost, manipulations about the kidney are painful unless the anesthetic is given so high in the spine that the risk of respiratory paralysis is greatly increased. Because of the uncertainty of securing anesthesia if the drug is injected low, and because of the danger if it is given high, and, furthermore, on account of the psychic shock incident to an operation upon so vital an organ as the kidney, we are of the opinion that spinal anesthesia is unsuited for operations in this region.

For suprapubic operations upon the bladder for tumor and diver-

ticulum, spinal anesthesia has been satisfactory, provided the operation can be finished within the period of anesthesia. Even if a small quantity of ether is needed towards the end, the time which the patient has been spared from etherization is important. Simple cystotomy we usually do under local anesthesia. When more has to be done, particularly in cases with kidneys damaged by sepsis or back pressure, spinal anesthesia takes rank as one of the safest anesthetics. Gas-oxygen also spares the kidneys, but it is dangerous in myocarditis.²² Not infrequently it troubles the surgeon through poor relaxation of the abdominal muscles and through causing a bloody, congested field, and under many conditions the apparatus and the experience in anesthesia which are required are not available. Fatalities under gas-oxygen, furthermore, are not rare. Miller, in 1912, found 19 reported. With spinal anesthesia one can usually count on a full hour in which to operate, and has not the hurried feeling which ether or gas-oxygen anesthesia may give when the patient is not in good condition. As a rule, bladder tumor and diverticulum occur in patients of middle age rather than in old arteriosclerotics. These patients do not appear to be affected by the anesthesia so adversely as do the latter.

Zur Verth²³ has noted that in operations for bladder tumor, stone, etc., the blood-pressure has not fallen so low as in prostatectomies upon patients in whom there was advanced arteriosclerosis. Whether the blood-pressure falls more in arteriosclerosis, or whether arteriosclerotics bear the fall less well, is not clear, but it has been our experience that in patients with marked arteriosclerosis, spinal anesthesia must be used with care.

For this reason, we are not relying upon this method absolutely in suprapubic prostatectomy. In many cases, even though arterial and cardiac disease is far advanced, it works remarkably well. In other cases, operation is followed within a few days by a cardiac decompensation which sometimes ends fatally. In all the half dozen cases of prostatectomy in which the blood-pressure has been followed by Dr. E. G. Crabtree, Resident Surgeon at the Massachusetts General Hospital, and the writer, marked drops in blood-pressure have been observed, some pressures falling as much as 80 or 100 mm. Hg. within a half-hour. The fall if severe has been accompanied by pallor, nausea, vomiting, sweating, air-hunger and a small, irregular pulse.

It has been suggested by Cabot that the abrupt variations of blood-pressure in these old patients are too much for their hypertrophied, dilated and myocarditic hearts. As the blood-pressure rises after operation, the heart goes to pieces and broken compensation results. Two of our 31 suprapubic prostatectomies died with signs of uncomplicated cardiac failure. Three other fatal cases had more or less severe post-operative hemorrhage, and while

the amount of blood lost seemed insufficient to cause death in a healthy person, in these cases it seemed to promote circulatory failure. Six of the 31 prostatectomies had pneumonia, not always fatal, and as very few of the other patients in whom spinal anesthesia was used had pneumonia, it would seem fair to think that the pneumonia was largely due to cardiac decompensation.

The question arises, What other anesthetic would give better results? In the writer's opinion, local anesthesia is unsuited for prostatectomy above the pubes. It may be that opening the bladder under local anesthesia and removing the prostate under general anesthesia will prove best. But if so, the operator must have a rapid method of controlling hemorrhage. The other alternative is to find a way of preventing the fall of blood-pressure during spinal anesthesia. In regard to this very point, Edwards²⁴ has suggested that pituitary extract be used. In the few cases in which he tried it, the effect desired seemed to be obtained.

For the present, we believe spinal anesthesia may be used with safety in those younger prostatitics who have not advanced arteriosclerosis. In men with stiff arteries and poor heart muscle, great caution should be employed.

In operations upon the perineum this method gives very excellent results. A rather small dose—0.075 grm. at most—will suffice, and it need not be driven high in the spinal canal. Operations upon the perineum, with the possible exception of vesiculectomy, do not seem to produce the psychic disturbance caused by operations above the pubes, perhaps because in the former event the patient does not feel the presence of the operator. Many men with stricture are notoriously hard to etherize, and they are frequently alcoholic. Damaged kidneys are common. In this class of patients spinal anesthesia might well be the anesthetic of election. This it certainly is in emergencies, unprepared for ether, who require immediate perineal section. The poor condition of patients of this class who delay treatment until the last minute is an added indication for spinal anesthesia.

We have used spinal anesthesia four times for seminal vesiculectomy—once alone, three times combined with ether. One case done under ether alone had considerable shock, and it was with the hope of preventing shock that spinal was combined with ether anesthesia in later cases. The result was satisfactory. The man done under spinal alone came through the operation well, although he was well along in years, and arteriosclerotic, besides having valvular disease. The writer sees no reason why spinal anesthesia should not be used, particularly since with ether alone there was shock out of all proportion to the severity of the operation.

Operations upon the penis and scrotum should be done under local anesthesia if possible. In operations for tuberculous lesions within

the scrotum, we have believed that spinal anesthesia should be used rather than ether, because of the effect of the latter upon latent pulmonary tuberculosis. For amputation of the penis and dissections of the groin, which would require a fairly lengthy period under ether, spinal anesthesia may be indicated, unless the patient is in unusually good condition.

The radical cure of varicocele and hydrocele should be done under local anesthesia. If the patient's psychic condition does not admit of this, he would probably not be calm with spinal anesthesia, particularly as the latter does not prevent entirely the sensation elicited by pulling on the testis and the cord.

For intravesical manipulation, spinal anesthesia is peculiarly well adapted. We have used it for 5 litholapaxies and 16 cystoscopies. A small dose—0.05 to 0.06 grm. suffices, and, as was first pointed out by Albarran, it allows of a much greater distention of the bladder before setting reflexes in action than does any form of general anesthesia. The viscus is practically paralyzed; spasm disappears, and it is rare indeed that one cannot secure sufficient distention for cystoscopy or litholapaxy. For crushing stones in old men with cystitis, for securing anesthesia during fulguration in sensitive bladders, and particularly for cystoscopy in tuberculous cystitis, we have found spinal anesthesia invaluable. One almost never sees under these conditions the shock which occurs during some operations under spinal anesthesia. (This fact lends support to the theory that there are some afferent tracts, perhaps the sympathetic, which spinal anesthesia does not block.) The duration of the anesthesia is sufficient to allow thorough search for the ureters and the employment of chromocystoscopy and the functional tests. There is singularly little disturbance of the bladder after these intravesical operations. Had they been done without anesthesia, the bladder disturbance would have been far more severe. We have not hesitated to discharge patients a day or two after cystoscopy, although some cases have had to be kept quiet longer because of headache.

From our results with 100 cases of spinal anesthesia, and from the experiences of others, we feel that the method *per se*, if properly carried out, bears only a very slight risk. The greatest risk comes from the fall of blood-pressure which it occasions, especially in arteriosclerotics. It should not be used when local anesthesia will suffice. In patients with tuberculosis, renal disease or debility, and in emergency cases unprepared for etherization, it is of the greatest value.

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THE GONOCOCCUS COMPLEMENT-FIXATION TEST.

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The fact that micro-organisms, when mixed with their homologous antisera, are capable of rendering complement inactive, as shown by the absence of hemolysis when sensitized erythrocytes are added to the mixture, was first observed by Bordet and Gengou¹ in 1901. This phenomenon has since become well known as fixation of complement; also spoken of as deviation of, deflection of, or absorption of complement.

The principle underlying this reaction has been of great value in determining the presence of substances in sera whose reactive processes are not indicated by any perceptible result, such as agglutination or precipitation.

Applying this principle of complement-fixation for the purpose of the diagnosis of syphilis, Wassermann, Neisser and Bruck,² in 1906, published their results. They used, as antigen, extracts of syphilitic organs which were rich in *treponemata pallida* and considered the resulting fixation of complement as due to the interaction of the *treponema pallidum* and its specific antibody present in the tested serum.

That the Wassermann reaction is not necessarily a true antigen-antibody combination with subsequent absorption of complement has been shown by many investigators. The antigen need not be prepared from a tissue containing the *treponema*, but may be made from normal organs, and when cholesterin is added to these extracts of normal organs, as shown by Walker and Swift³ and Kolmer, Laubaugh, Casselman and Williams,⁴ they produce as good, and usually better, results than the extracts of syphilitic fetal livers which are rich in *treponemata*. It has also been demonstrated by Noguchi,⁵ Craig and Nichols,⁶ and Kolmer, Williams and Laubaugh,⁷ that antigens prepared from pure cultures of the *treponema pallidum* are less than half as efficient as the organ extracts in the serum diagnosis of syphilis, probably due to the paucity of true *treponema* antibodies. The antigens are of a non-specific lipid nature and of the reaction products of the *treponema pallidum* in its host, the 'syphilis antibodies,' the most prominent feature is their great affinity for lipoids. This lipoidophilic antibody or 'reagin' is not a specific *treponema* antibody, but it is found with any degree of constancy in only two other infections, frambesia and leprosy.

Thus, while the Wassermann test is not a truly specific reaction,

its immense value in the diagnosis of syphilis has never been successfully depreciated.

On the other hand, however, the fixation of complement in the test under discussion is a result of the specific interaction of antigen and its own antibody; the antigen is a preparation of the gonococcus and the antibody is produced in the host by the action of the gonococcus.

Mueller and Oppenheim,⁸ in 1906, were the first to use this method for the detection of antibodies in the blood serum of a patient infected with the gonococcus. They showed that the serum of this patient, who had gonorrheal arthritis, when mixed with a suspension of gonococci in salt solution as antigen, was able to fix complement and thereby prevent hemolysis when sensitized erythrocytes were added. Under similar test conditions, the sera of individuals suffering from infections other than gonorrheal did not prevent hemolysis. Meakins,⁹ in 1907, was the first in this country to report his results with this method when 3 cases of gonorrheal arthritis gave positive reactions. Other reports were soon published and the investigators obtained more or less contradictory results. It remained for Teague and Torrey¹⁰ to clear up some of this confusion by showing that the differences in results were probably due to the use of single strains of the gonococcus as antigens. "The serum of an animal immunized to one strain of gonococcus may not cause 'fixation of complement' when tested against an antigen obtained from another strain. This confirms the view, already advanced by one of us, from a study of the agglutinins and precipitins of the gonococcus, that we are dealing with a heterogeneous family of organisms. . . . In attempting the diagnosis of gonorrheal affections by this method, extracts of several different strains should be employed."

Schwartz and McNeil,¹¹ in 1911, were the first to utilize the conclusions arrived at by Teague and Torrey, and they reported the results of testing 324 human sera with an antigen prepared from twelve strains of gonococci, and came to the conclusion that if only one strain is used in the preparation of the antigen, a great many negative results would be obtained in positive cases. "An antigen prepared from many strains fixes complement whenever one of its component strains does so, and consequently the necessity of testing a serum against a number of antigens separately is avoided. It is not to be denied that there are probably other strains of gonococci differing widely from any present in the polyvalent antigen, so that at times a negative result will be obtained in a positive case. We consider, however, that working with an antigen composed of many strains, one will obtain a positive reaction in the great majority of cases of gonococcal infection, and the use of the polyvalent antigen simplifies the procedure so that it can be of practical value

for diagnostic purposes." Their splendid results have stimulated increased interest in the test and the reports of the following, giving the results of almost 6,000 tests, indicate the reliability and practical value of the test: Gardner and Clowes,¹² 185 cases; Gradwohl,¹³ 45 cases; Keyes,¹⁴ 34 cases; Kolmer and Brown,¹⁵ 92 cases; McNeil,¹⁶ 4,000 cases; O'Neil,¹⁷ 256 cases; Rockwood,¹⁸ 500 cases; Schmidt,¹⁹ 77 cases; Schwartz,²⁰ 110 cases; Swinburne,²¹ 237 cases; Thomas and Ivy,²² 204 cases.

MATERIALS AND TECHNIQUE.

Patient's Serum.—Bearing in mind that the amount of antibodies formed in a local gonococcal infection is probably small, owing to the limited cellular involvement, it was deemed advisable to use a larger quantity of serum than is usual in complement-fixation tests, and accordingly five times, proportionately to the other reagents, the amount of the original Wassermann test quantity was determined upon.

The blood is obtained preferably from a vein under aseptic precautions and at least 5 c.cm. are necessary for the test. The serum is removed from the clot, centrifugalized if any cells appear to be in it, and is inactivated by heating in a water-bath at 55° C. for thirty minutes.

The serum is then tested for the presence of natural antisheep amboceptor, using the test dose of serum (0.2 c.cm.) with the test doses of complement (0.2 c.cm.) and sheep erythrocytes (0.2 c.cm.) to be described later. If found to be present and causing more than a trace of hemolysis, it is removed by adding to the serum 0.6 per cent. of the undiluted washed sheep corpuscles, placing in a vessel containing cracked ice for thirty minutes and then removing the cells by centrifugalization. It has been necessary to remove it in about two-thirds (48 of 71) of the sera tested.*

Antigen.—Realizing that the preparation of the antigen is one of the most important steps in these tests, the writer will go somewhat into the details of its production. In the first place, it has been possible for him to obtain twenty-eight cultures, thus insuring a considerable degree of polyvalency. Secondly, it was endeavored to extract all the constituents of the organisms entering into the antigen—the endotoxins as well as the bacterial protoplasm—by much shaking and autolysis and not passing it through a dense filter. It was not sterilized with heat, but by the addition of a small amount of tricresol (0.3 per cent.). By these measures it was hoped to attain the optimum of antigenic properties.

*This procedure can be obviated by using an antihuman hemolytic system, but as a mere matter of convenience, the writer uses the antisheep system because the reagents are always at hand and standardized for his Wassermann work.

Kolmer and Brown, after making a study of antigens prepared in various ways, state that "best results were secured with a simple antigen composed of gonococci suspended in sterile normal saline solution plus a preservative. Even in normal saline solution, autolysis rapidly occurs, but it appears that the bacterial protein, aside from the endotoxins, possesses antigenic principles, and they add to the antigenic value of the preparation."

The antigen prepared by the writer, and used in the tests here reported, was made as follows: Twenty-eight different cultures, obtained from various sources,* were grown on hydrocele-agar for four days, washed off with sterile, distilled water and centrifugalized. The supernatant liquid was discarded and the sediment washed with distilled water. The suspension was centrifugalized and the sediment again freed of the wash-water. To the sediment, sterile, 0.85 per cent. salt solution made with distilled water was added in the proportion of 100:1. The suspension was placed in a container with glass beads and shaken for twenty-four hours. It was removed to the incubator and allowed to autolyze for forty-eight hours at 37.5° C., and then it was filtered through coarse paper to remove the glass beads. After this, 0.3 per cent. of tricresol was added and the product placed in a brown bottle and stored in the refrigerator. At the expiration of two weeks the suspension was tested for its sterility and was found to be sterile. For use in the fixation tests this antigen is diluted with nine parts of 0.85 per cent. salt solution.

The amount of antigen to be used was determined as follows.

Anticomplementary Value.—Increasing amounts of antigen diluted 1:10 were added to 0.2 c.cm. inactivated, normal, human serum, 0.2 c.cm. complement 1:10, normal saline sufficient to make the end volume 2.0 c.cm., and incubated in the water-bath at 38° C. for thirty minutes. Then one unit of amboceptor and sheep erythrocytes, 0.2 c.cm., were added, incubated again for thirty minutes and the results read. This indicates the largest amount of the antigen which will not inhibit hemolysis under exact test conditions.

ANTICOMPLEMENTARY TITRATION.

Antigen (1:10)	Result
0.75 c.cm.	Complete hemolysis
1.0	Complete hemolysis
1.25	Slight inhibition of hemolysis
1.5	Marked inhibition of hemolysis
1.75	No hemolysis
2.0	No hemolysis

Antigenic or Fixing Value.—Increasing amounts of the antigen diluted 1:10 were added to 0.2 c.cm. of inactivated serum, obtained

*The writer is indebted to the following for many of the cultures, and wishes here to express his thanks to them for their courtesy: The Cutter Laboratory, The H. K. Mulford Company, and Parke, Davis and Company.

from a patient with chronic gonorrheal arthritis, plus the same doses of reagents as above and a similar process carried out. This will indicate the smallest amount of antigen which will fix complement and inhibit hemolysis in the presence of a positive serum under exact test conditions.

ANTIGENIC TITRATION.

Antigen (1:10)	Result
0.025 c.cm.	Complete hemolysis
0.05	Slight inhibition of hemolysis
0.075	Marked inhibition of hemolysis
0.1	No hemolysis

Studying the results of these titrations, it is found that when the antigen is diluted 1:10, it becomes anticomplementary at 1.25 c.cm., is not hemolytic at 2.0 c.cm., and is antigenic at 0.05 c.cm. Most of the workers advise the use of one-half the anticomplementary dose, but in this series of tests about one-third (0.4 c.cm.) has been adopted as the highest antigenic dose. The positive serum used in these titrations was exceptionally rich in antibodies, as shown by the small amount of antigen necessary to cause inhibition of hemolysis. Since the above original titrations, the antigen has been repeatedly titrated during the past ten months and it has remained remarkably constant in value.

The sera of 29 cases were tested simultaneously with two other gonococcus antigens; one an experimental antigen given to the writer by Dr. Claude P. Brown of the H. K. Mulford Company, and the other was prepared by Parke, Davis and Company and purchased in the open market. In all the tests giving a positive reaction with either or both of these antigens, using one-half the anticomplementary dose, the writer's were also positive. The comparative results are shown below.

Antigen	Positive	Negative
Writer's.	21	8
Mulford's.	20	9
Parke, Davis'.	18	11

Hemolytic System.—The antisheep hemolytic system is used. Fresh guinea-pig serum, diluted 1:10 with normal saline, serves as complement in 0.2 c.cm. amounts. The sheep corpuscles are washed three times with salt solution and made up into a 5 per cent. suspension and used in 0.2 c.cm. doses. The antisheep amboceptor is diluted so that about 0.1 c.cm. usually contains one hemolytic unit. The amboceptor is always titrated against 0.2 c.cm. of the serum to be tested and the above amounts of complement and cells and the total amount made up to 2.0 c.cm. with salt solution. One hemolytic unit is used in the test. It is of the utmost

importance to adjust the hemolytic system to the greatest degree of accuracy. By not having an excess of amboceptor, the smaller degrees of complement-fixation are recognized, and owing to the generally minute amount of antibody present in the tested serum, this is of great value in obtaining a correct result.

The Test.—A résumé of all the preceding practical points and exactly how a test is conducted is condensed into the following:—

1. Prepare complement and dilute 1:10.
2. Prepare corpuscle suspension and dilute 1:10.
3. Prepare patient's serum and inactivate at 55° C. for thirty minutes.
4. Determine if the patient's serum contains natural antishoop hemolysin by using serum 0.2 c.cm. plus complement 0.2 c.cm., cells 0.2 c.cm., and saline q. s. 2.0 c.cm. Incubate in the water-bath at 38° C. for thirty minutes. If present, remove it by adding 0.6 per cent. of undiluted washed sheep corpuscles, pack in ice for thirty minutes and centrifugalize.
5. Titrate the antishoop amboceptor against the patient's serum 0.2 c.cm., complement 0.2 c.cm., cells 0.2 c.cm., and saline q. s. 2.0 c.cm. Incubate in the water-bath for thirty minutes. Dilute so that 0.3 c.cm. contains exactly one unit.
6. Dilute the antigen 1:10.
7. Set up the test as follows:—

	Serum	Antigen	Comp.	Saline		Ambocep.	Cells	Results
					I			
Tube 1...	0.2	0.4	0.2	0.7	N	0.3	0.2	?
Tube 2...	0.2	0.3	0.2	0.8	C	0.3	0.2	?
Tube 3...	0.2	0.2	0.2	0.9	U	0.3	0.2	?
Tube 4...	0.2	0.1	0.2	1.0	B	0.3	0.2	?
Tube 5...	0.2	0	0.2	1.1	A	0.3	0.2	100 per cent. hemolysis
Tube 6...	0	0.8	0.2	0.5	T	0.3	0.2	100 per cent. hemolysis
Tube 7...	0	0.6	0.2	0.7	E	0.3	0.2	100 per cent. hemolysis
Tube 8...	0	0.4	0.2	0.9	30	0.3	0.2	100 per cent. hemolysis
Tube 9...	0	0	0.2	1.3	30	0.3	0.2	100 per cent. hemolysis
Tube 10...	0	0	0.2	1.6	M	0	0.2	No hemolysis
Tube 11...	0	0	0	1.8	I	0	0.2	No hemolysis
					N.			

The serum-antigen-complement-saline mixture and the controls are placed in the water-bath at 38° C. for thirty minutes and then the amboceptor and the cells are added. They remain in the water-bath until the serum and antigen controls (tubes 5, 6, 7, 8) are hemolyzed, when they are removed and the readings immediately made.

An explanation of the above results is desirable. It will be noted that Tubes 1, 2, 3 and 4 contain the same amounts of all the reagents with the exception of the decreasing doses of antigen. This

is done for the purpose of measuring the quantity of gonococcal antibody present in the serum. It is interesting to record that of the 47 positive reactions obtained, only 2 (4 per cent.) sera inhibited hemolysis with 0.1 c.cm. of antigen, 21 (44 per cent.) with 0.2 c.cm., and 40 (85 per cent.) with 0.3 c.cm. Therefore, the contents of these tubes will, or will not be hemolyzed, depending on the absence or presence, in varying amounts, of the gonococcal antibody; in other words, whether the serum reacts negatively or positively. Tube 5 is the serum control informing us that the serum alone or its antibody content does not inhibit hemolysis. Tubes 6, 7, and 8 are the antigen controls and indicate that *twice* the amount of antigen used in the test does not inhibit hemolysis. Tube 9 is the hemolytic control and tells us that the hemolytic system is correctly adjusted. Tube 10, the complement control, informs us that the guinea-pig serum does not contain natural antisheep hemolysin. Tube 11 is the corpuscle control and points out that the cells are in good condition and that the salt solution is isotonic.

Results.—Seventy-one cases have been tested with the above method and the following table presents their classification and the results obtained with the gonococcus complement-fixation test:—

Clinical Diagnosis	Total	Positive	Negative
Arthritis.	32	29 (91 per cent.)	3 (9 per cent.)
Chronic urethritis.	10	8 (80 per cent.)	2 (20 per cent.)
Various controls.	9	2 (22 per cent.)	7 (78 per cent.)
Cured G.-U. disease.	6	2 (33 per cent.)	4 (67 per cent.)
Salpingitis.	5	3 (60 per cent.)	2 (40 per cent.)
Acute urethritis.	4	2 (50 per cent.)	2 (50 per cent.)
Endometritis.	3	1 (33 per cent.)	2 (67 per cent.)
Vaginitis.	2	0	2
	71	47 (66 per cent.)	24 (34 per cent.)

The writer will not tabulate the individual cases examined, but will draw attention to a few of the more interesting and instructive ones where, owing to the lack of a bacteriological diagnosis or of a specific history, the serum test has been an aid in pointing out the true etiology of an affection.

DISCUSSION.

Among the arthritic cases was a patient who suffered with an acute inflammation of a wrist, together with an acute gonorrhea of three weeks' duration. The test was negative. It was thought that the negative reaction was due to the short duration of the urethral infection and that the arthritis was gonorrheal in nature. Nevertheless, salicylates were given and a beneficial result almost immediately occurred. This outcome should serve as a warning to the clinician that a patient may have at least two infections at the same

time. Had this serum reacted positively, almost surely an incorrect conclusion would have been drawn and wrong treatment instituted. Just as with the Wassermann reaction, the result of a gonococcus complement-fixation test should be accepted as merely one sign or symptom, and it should always be borne in mind that gonorrhea is extremely common in both men and women in interpreting the relationship between an arthritis or any other suspected gonorrheal affection and a positive fixation test.

Another, presented a polyarthritis involving the fingers and toes and reacted negatively. The patient gave a history of gonorrhea about ten years previously. The serum, however, gave a positive Wassermann reaction, and under appropriate treatment the patient improved.

A girl, aged sixteen, had an enlarged knee and ran a persistently high temperature (100 to 102° F.). It was considered a tuberculous process. Her blood was sent in for a gonococcus fixation test and reacted positively. Her physician reported that her temperature returned to normal following a small dose of gonococcic vaccine given intradermically and that she has since made good progress.

Among the control cases, 5 had positive Wassermann reactions and all gave negative gonococcus fixation. Four of the cases of chronic urethritis, giving positive gonococcus fixation tests, reacted positively with the Wassermann. Accordingly, it does not appear that the syphilitic antibodies interfere in any manner with the action of the gonococcal antibody in inhibiting hemolysis.

One of the cases among the controls which reacted positively, was a man who had had gonorrhea fifteen years previously but who showed no evidence of it in his urine or elsewhere at the time of the test. It was an accidental finding, and where the gonococcal focus, if any, was located, was not ascertained.

The other positive control case was also discovered purely by chance. The patient had severe sciatica and her blood was sent in for a Wassermann test, which resulted negatively. As the writer was making a gonorrheal test that day, the serum was used to add to his series of cases. It was strongly positive. No gonorrheal history was obtainable, but with the use of gonococcic vaccine the patient made a complete recovery.

The patient reacting positively among the cured cases showed an enlarged prostate but no shreds, pus or gonococci in the urine. The value of the test in these so-called cured cases is marked, especially in those wishing to marry. Of course, the test may remain positive for quite a while, maybe up to two months, or even longer, after the infection is eradicated, due to the presence of immune-bodies which have not yet been eliminated. However, it will probably prove safe to consider a 'cured' case giving a positive test as

still capable of infecting others. A negative test, subsequent to a positive, under such circumstances, is entitled to be considered absolute proof of the absence of a gonococcal focus.

The results in the gynecological cases, while the number of cases is small, agree with those of other observers and seem to show that the pelvic infection must ascend to or above the cervix before a positive response is obtainable by the fixation test. Thus, one-half of the cases of salpingitis and endometritis reacted positively, while both of the vaginitis cases, each showing Gram-negative diplococci in smears, as well as the one case of acute urethritis in a woman, reacted negatively.

One of the cases of acute urethritis which gave a positive reaction is of interest. The discharge was profuse, containing Gram-negative diplococci, and had existed for about three weeks. During this time the patient had received two doses of gonococcic vaccine. Thomas and Ivy²³ state that "in a primary uncomplicated acute case we have never observed a positive reaction prior to the sixth week, nor have we obtained positive reactions where the anterior urethra or vagina alone were involved." The positive reaction in this case was most probably due to the antibodies produced as a result of the injection of the gonococci contained in the vaccine. However, this view is contradicted by Keyes,²⁴ who injected himself with gonococcic vaccine, and found that his previous negative reaction remained unaffected.

CONCLUSIONS.

Based chiefly on the results of other investigators, but bearing in mind the few observations described in this article, the following conclusions are apparently justified:—

To be of much practical value, the gonococcus complement-fixation test must be conducted with a polyvalent antigen and the hemolytic indicators must be carefully adjusted and repeatedly titrated.

The only serious difficulty encountered is the isolating and carrying of a sufficient number of cultures of gonococci to prepare a satisfactory antigen. This can be avoided, in the practical application of the test, by using one of the prepared antigens now on the market which give excellent results.

The test is absolutely specific for the gonococcus. In no infection, other than gonococcal, has a positive reaction been obtained. Thus, it is more specific than the Wassermann test is for syphilis.

A positive reaction is always reliable and an indication of a gonococcal infection somewhere in the body. The only exceptions are when the serum is obtained from an individual who has recently received gonococcic vaccine or has just recovered from a gonorrheal infection and the immune bodies have not yet been eliminated—a variable length of time, but probably not exceeding two months.

Inoculations of gonococcic vaccine or of antigonococcus serum may cause a positive reaction in a normal or a cured individual.

The test is of particular value in suspected gonococcal infection in which the gonococcus cannot be discovered bacteriologically. In doubtful cases, the only proof of a specific infection is the cultivation of the gonococcus. As a matter of technique, the acquiring of the gonococcus in culture, owing to its susceptibility to cooling, its association with other rapidly growing organisms, and the need of special media, is much more difficult than the fixation test. Except in acute cases, where the gonococci are abundant, the positive evidence produced by a Gram-stained smear should not be accepted as conclusive; among the sources of error may be mentioned the micrococcus catarrhalis, the diplococcus crassus, irregular types of Gram-negative cocci, and "most important of all are the so-called 'degeneration' forms of staphylococci . . . the accuracy with which these may simulate the intracellular Gram-negative gonococcus, these staphylococci are responsible for most of the errors of smear diagnosis."—Keyes.

In interpreting a positive test, it should always be borne in mind that gonorrhea is a very widespread disease and that an individual may suffer from at least two different infections.

A positive reaction occurring in a patient supposedly cured of gonorrhea, indicates the presence of a gonococcal focus and the capability of infecting others. The importance of this in connection with marriage is great. A positive reaction occurs in about 20 per cent. of those clinically cured.

A positive reaction in acute uncomplicated posterior urethritis does not occur before six weeks; never, when the infection is limited to the anterior urethra or vagina.

In acute cases, in which the gonococci are usually easily demonstrated, the fixation test is generally negative. On the contrary, in the chronic and ill-defined affections, where it is not usually feasible to obtain the organism, the test acquires its greatest sensitiveness.

A negative reaction does not exclude gonococcal infection, especially in the acute and subacute stages, without complications, when it is limited to the urethra or vagina.

Syphilis or a positive Wassermann reaction does not interfere with the test in any manner.

It is of particular value in the diagnosis of gonorrheal arthritis, giving about 100 per cent. positive reactions.

Gonorrheal epididymitis, at least by the fifth week, also gives about 100 per cent. positive reactions.

Chronic posterior urethritis, prostatitis, and seminal vesiculitis, with recurrent exacerbations, give about 75 per cent. positive reactions.

Pyosalpingitis gives about 65 per cent. positive reactions.

About 65 per cent. of all stricture cases give positive reactions.

In gynecology, it has proved its value in the differential diagnosis of pelvic inflammatory diseases from one another and from neoplasms. The test is usually negative in uncomplicated cases of urethritis, vulvo-vaginitis, and Bartholinitis; it appears that the infection must reach at least to the level of the uterus before a positive reaction occurs.

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SOME OF THE CAUSES OF URETERAL OBSTRUCTION— WITH SPECIAL REFERENCE TO DIFFERENTIAL DIAGNOSIS.

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The question of accurate differential diagnosis of the various lesions which may cause either partial or complete ureteral obstruction must always remain in a somewhat uncertain and unsatisfactory state when based solely upon the clinical manifestations, because of the intimate topographical relationship of the ureter to other abdomino-pelvic structures and the fact that palpation of the entire normal ureter is impossible. The mobility of the subjacent organs, whether they be normal or pathological, and their contiguity to the upper urogenital tract, must be constantly borne in mind in connection with attempted differential diagnosis; likewise, the observation is important that in the majority of instances the obstruction is mechanical in character, *i. e.*, being only occasionally produced by pathology originating within the ureteral lumen. In arriving at a satisfactory diagnosis, therefore, one must necessarily depend almost exclusively upon mechanical means—namely, cystoscopy, ureteral catheterization and radiography. The subjective symptoms are of little value in the differential diagnosis.

Among the most prolific causes of ureteral obstruction, some of which are not mentioned in previous literature, the following appear entitled to specific consideration:—

1. Calculi either occluding the reno-ureteral aperture or passing into the ureteral lumen.
2. The so-called 'congenital valve' occurring near the ureterorenal junction.
3. Kinking with stenosis from an inordinately elongated otherwise normal ureter.
4. Anomalous anatomic developmental conformation with obliteration of the ureteral lumen.
5. Kinking with stenosis from displacement of the ureter by pressure of neoplasms including the gravid uterus.
6. Extension of inflammatory exudate and adhesions (post-operative or otherwise) from previous appendicitis, particularly the chronic so-called postcecal type.

7. Angulation and displacement of the ureter from exaggerated visceroptosis.

8. Extension of inflammation from infection of the uterus and its appendages.

9. The so-called 'pus obstruction' from pyelitis of tuberculous or other infective origin.

10. Ascending infection (from cystitis) the result of Neisserian or other pyogenic organisms.

11. Intussusception from previous obstruction with dilatation of the proximal ureter.

It will be noted from the foregoing list that contrary to the influence suggested by perusal of the literature, ureteral obstruction may be due to a variety of causes other than calculi which have escaped from the kidney pelvis. It is believed the following hypotheses have been reasonably substantiated: (a) That calculi resident in the ureter are invariably renal in origin; (b) that calculous formation within the ureteral lumen practically never occurs; (c) that smooth concretions of insufficient size to induce obstruction not infrequently migrate from the kidney pelvis to the bladder and are voided with the urine without the production of indicative symptoms; (d) that calculi may even exist within the ureteral lumen for an indefinite period and yet their size and location be such that there results little or no interference with the urinary outflow; (e) that only when calculi are sufficiently large to produce partial or complete obstruction do typical clinical manifestations ensue. A satisfactory diagnosis of calculous obstruction can practically always be made by cystoscopy, ureteral catheterization and radiography, definite localization being easily accomplished by the latter.

In a relatively small number of cases ureteral obstruction may be produced by an anomalous anatomic occlusion of the uretero-renal orifice by what has been described as a 'congenital valve,' *i. e.*, a valve-like fold of the mucosa which causes either partial or complete obstruction to the urinary outflow. Fortunately such anomalous conformations are exceedingly rare, and their definite determination is usually possible only at operation or necropsy. There may simply be atrophy of the kidney on the implicated side, and the lesion remains unsuspected during life. Although a few cases of acquired ureteral obstructing valves have been reported, these must be of greater rarity than the congenital type, and a differential diagnosis from obstruction due to other causes would be difficult. Obviously there would be little or no resistance to introduction of the catheter, and radiography would merely confirm the existence of obstruction without indicative evidence as to the cause.

Occasionally the otherwise apparently normal ureter may be so

elongated that kinking with partial or complete obstruction to the urinary outflow is the logical result. Elongation may occur as an anatomic developmental departure from the normal, as the result of stretching due to the presence of a neoplasm, or a similar effect may be produced by a markedly prolapsed but normally functioning kidney. Catheterization will reveal the obstruction, which may be confirmed by pyelography, and the determining cause is suggested by the abnormal position of the kidney as demonstrated by palpation.

When the ureteral lumen is entirely obliterated by anomalous anatomic development, there are usually other departures from the normal in conformation of the urogenital tract—namely, the so-called horseshoe kidney, fused kidney, supernumerary functioning ureter with anomalous location of its vesical orifice, total absence or rudimentary development of one kidney, etc. Since renal function is unimpaired in the majority of such instances, the anomaly is more often than otherwise discovered only at necropsy. In some cases, however, the supervention of renal pathology may render operation necessary, and the abnormality is thus revealed. If, however, the condition is suspected, the present approved methods of clinical examination may discover it.

The ureter may become so kinked or stenosed by displacement due to pressure from neoplasms involving subjacent structures that obstruction gradually ensues. In pregnant women a similar condition sometimes occurs. The proximity of the ureter and the probability of obstruction should always be borne in mind when estimating the dangers accruing from the presence of neoplastic formations. The likelihood of inflicting irreparable damage upon the ureter during operative removal of abdomino-pelvic tumors which have encroached upon the urogenital tract is also an important feature. In this type, as the obstruction develops gradually, the urine usually remains normal and the cause of the obstruction should be readily apparent to the careful observer. The diagnosis is therefore indicated by consideration of the clinical signs, and may be confirmed by mechanical measures.

A not infrequent cause of ureteral stenosis is the direct extension of contiguous inflammatory exudate with incorporation of the ureter in dense adhesions following operation for previous appendicitis, especially the neglected postcecal type. This is not difficult to understand when one recalls the normal proximity of the ureter to the postcecal space, and the wonder is that ureteral obstruction does not more frequently ensue from this cause. The diagnosis is determined by catheterization which definitely locates the point of stenosis, and confirmation is afforded by pyelography. The cause of the obstruction becomes obvious by the evidence deduced from clinical investigation.

The recent and extensive studies which have been accorded the subject of visceroptosis have demonstrated that its effects are more far-reaching than was at first admitted by the most enthusiastic surgeons and internists. Ureteral occlusion is now known to be a common result of this affliction. In the descent of the abdominal organs the ureters may be so markedly displaced that occlusion occurs from angulation. This suggests a reasonable explanation for some of the symptoms referred to the urogenital tract which have been noted as concomitants of general visceroptosis. The diagnosis of complicating ureteral obstruction should not be difficult by the usual methods of examination, and the cause is suggested by the marked visceral displacement.

Considering the rather intimate anatomical relationship between the ureters and the uterus with its appendages, it is not difficult to understand that extension of infection from the latter organs occasionally causes ureteral obstruction. The lesion under such circumstances being inflammatory in character, the result of extension of infection, with thickening of the ureteral wall from the exudate, renders this one of the most serious types of obstruction. The diagnosis is difficult and must be made by the exclusion of other probable factors. The ureter may be thickened for a considerable distance, and all methods of examination are tedious and unsatisfactory. The gradual progression of the obstruction, however, should suggest the causal relationship of the inflammatory lesions in the other situations mentioned.

Partial or temporary obstruction may ensue from the accumulated exudate of renal tuberculosis, the pus from any type of pyelitis, the coagula of blood, lymph, etc. Solidification of the accumulated material may result in total obstruction. Differential diagnosis in this type is comparatively easy, and the obstruction may be overcome and the ureter rendered patulous by catheterization.

Ascending infection (from cystitis) sufficiently severe to cause ureteral obstruction is exceedingly rare. The bladder is infrequently invaded by the diplococcus of Neisser, and infection due to other organisms is seldom so virulent in type that extension to the ureteral mucosa occurs. When obstruction ensues from this cause the diagnosis is attended by numerous difficulties, although by the elimination of other probable causes, and according proper consideration to the vesical lesion, differentiation may be satisfactorily accomplished.

A cause of secondary obstruction of which no mention appears to have been made in the literature excepting by the writer, is described as an intussusception (literally a 'reverse' intussusception), *i. e.*, as a result of previous obstruction there occurs an enormous

dilatation of the proximal portion of the ureter which so completely enfolds the distal extremity that the lumen of the latter is entirely obliterated. Obviously the greater the pressure from above, the more tightly is the distal ureter closed. The introduction of a catheter in this form of obstruction is oftentimes impossible, and little information is afforded by radiography, therefore accurate ante-operative diagnosis is ordinarily impracticable.

400 Atherton Building.

VACCINE TREATMENT OF DISEASES OF THE GENITO-
URINARY TRACT AND THEIR SEQUELÆ
(WITH REPORT OF CASES).

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The diseases of the genito-urinary tract and their sequelæ offer one of the greatest fields for the application of vaccines. They yield some of the most brilliant results, but at the same time present some of the greatest difficulties as well as complete failures. If the proper organism is found, one can expect a therapeutic reaction and immediate results. If, on the other hand, a variety of bacteria is combined in a culture, there may be less severe reactions, and, therefore, less marked benefit.

It is our purpose in this paper to point out the great technical difficulties in this type of cases; to cite our experience with the infections of the urinary tract proper, and the more obscure metastatic infections in joints, bones, and distant organs. We will endeavor to point out the great variety of lesions and the large number of important and non-important organisms found in the various cases. The method of treatment and the dosage of the vaccine will be considered in detail, and it must be remembered that much of the treatment is empirical. We will also endeavor to cite the experiences of others who have treated cases of this type.

Vaccines are indicated in all types of bacterial infections of the genito-urinary tract where there is no mechanical obstruction to the normal urinary outlet or to the drainage of infectious products and where the physical condition of the patient will permit of their administration. In lesions associated with obstruction to the pelvis of the kidney, ureter or urethra, whether due to external causes, such as tumors, or intrinsic obstructions due to stones or strictures along the course of the urinary tract, very little should be expected from vaccine therapy alone. The indiscriminate use of vaccines in all cases of pyuria or slight urinary symptoms without definite bacteriological findings is to be discouraged and condemned.

The technique of preparing autogenous vaccines in genito-urinary cases is essentially the same as preparing vaccines in other infections where their use is indicated. The most difficult part of the procedure is to isolate the offending organism. To obtain, in pure culture, the etiological pathogenic bacteria from the genito-urinary tract is often impossible. The recommendation of many writers that each organism be isolated in order to obtain pure culture may be theoretically the thing to do. Practically, in many instances, you spoil the effectiveness of the vaccines by over-manipulation. If you obtain a pure culture from the first inoculation, the result from treatment is always better. But in a case where the specific organism cannot be obtained in pure culture, but is accompanied by other organisms, it becomes necessary to resort to diluting, plating in Petri dishes and isolation of colonies. This procedure necessarily puts the organism through several plants and, of course, attenuates it. To avoid attenuation is the main object in handling these growths. Bacteria do not become gradually attenuated. They drop 50 per cent. on the first transplant. If sufficient bacteria could be obtained from the body direct, without putting them upon culture media, the results from treatment would be much more gratifying.

With this knowledge in our possession it is needless to advance arguments to support the isolation theory.

If the infected area is accessible through the urinary tract, the organism can often be obtained from the urine. If the urine is the source of obtaining the culture, a sufficient number of tubes should be used to obtain the vaccine from the first growth. This growth may be mixed. So might the infection. A mixed vaccine is far more effective if it is in part made up of the offending organism than a pure strain of attenuated bacteria.

We usually inoculate ten to fifteen tubes and three bouillon flasks, and make the vaccine from the first growth. Use plain agar, ascitic agar, and slightly acid bouillon as media. If the urethra alone is infected, the gonococcus is most often the cause. In such cases we use ascitic agar and inoculate ten tubes. We sterilize, as well as possible, the external meatus, introduce a urethral speculum 2 cm., then obtain the culture through this tube direct from the mucous membrane of the urethra. This lessens to a great extent contamination from the external urethral orifice. If the prostate is involved, the organism may be obtained by massaging the prostate slightly, or by one long steady pressure over the gland. Then introduce into the urethra a sterile rubber catheter, 5 or 6 cm., and have the patient urinate into a sterile Erlenmeyer flask. If the culture is obtained from the female, the likelihood of contamination

is much greater, especially if the infection be in the uterus or vagina.*

The dosage should be governed by the individual case, and its clinical aspect. The number of dead bacteria that might with safety be given in one case, might cause distressing symptoms in another. No general rule can be applied. A patient suffering from an infection acquires a certain amount of immunity and may, by virtue of this immunity, stand a large first dose. It is usually safe to start with a dose of 100,000,000, and increase the amount rapidly until a reaction is obtained. Then wait three to eight days and give the same or a slightly raised dose. A severe headache and temperature of 102° F. are not indications to lower the dose. A severe local reaction, with great discomfort to the patient, often unnecessarily alarms the inexperienced physician. The fact that dead bacteria can cause necrosis must not be lost sight of, and too large amounts should not be given at one point, but distributed, if necessary, to several points. Giving vaccines intravenously would obviate this complication. The largest amount of bacteria given at one time should not exceed thirty billion. If the patient stands this amount, it may indicate that a non-pathogenic organism is being used, or that the vaccine has been overheated. Sixty degrees C. for one hour is sufficient to destroy most pathogens. As a double control a full dose of the sterile vaccine should be injected into a guinea-pig. This guards against contamination with anthrax, and if the animal remains well, indicates that the vaccine is sterile. We have discovered anthrax in one case by this precaution where the contamination was probably from the air.

Gaillard¹ lays great stress upon the microscopic examination of the urine of patients suffering from lesions of the genito-urinary tract, and says that he thus finds it possible to recognize the site of the lesions by the character of the epithelial cells. He claims to be able to detect the character of the lesion by the varieties of cells and intercellular tissues present; and the nature of the individual's 'constitution' by the nature of the pus cells. He says the pus cells are coarsely granular, refractive, and without visible nuclei when the body resistance is good, and finely granular with visible nuclei and irregular cell margin when the constitution becomes impaired.

*In order to increase the efficiency of our vaccines we are beginning a series of experiments with a new modification of culture media as suggested by Murphy. The object of this method is to grow the culture for autogenous vaccines upon media which are wholly or partly made up of the patient's own blood. It is a well-known fact, as demonstrated by Ross, that the blood cells have the power of diffusing through agar. Using this fact as a basis we are now making plants in blood agar, the blood being taken from the patient from whom the vaccine is to be made and spread in a thin film over agar-agar or ascitic agar. This must be done with absolute asepsis because the media cannot be sterilized after the serum is added. Just how greatly this will increase the efficiency of the vaccine must be determined by further experimentation. A detailed report, as well as the full technique, will be published at a later date.

The manner of bacterial invasion of the genito-urinary tract is divided by Scheidemandel,² as follows:—

(a) Hematogenous (descending) infection from bacteria, which in some way enter the blood-stream.

(b) Urogenous (ascending), rising from the lower urinary passages.

(c) Invasion by way of the lymphatics from the intestine.

Infection from the blood-stream is characterized by involvement of the parenchyma of the kidney. The clinical picture is variable. It has been demonstrated that bacterial invasion from such foci as the tonsils, middle ear and other local infections takes place. Perinephritic abscesses are produced by microbic invasion of the perirenal fatty tissues, the chief source being furuncles of the skin. The symptoms are high fever, sensitiveness of the kidney to fist percussion, as described by Murphy, and severe constitutional depression. In the early diagnosis, positive bacteriological findings in the urine are very significant. Invasion of the kidney alone is almost invariably from the blood. Where there is involvement of the renal pelvis, one must think of the ascending infections from the bladder and infections from the lymphatics.

The urogenous or ascending infections are promoted by the condition of urinary stasis.

Infection through the lymphatics has the anatomical basis in the lymph passages, reaching from the cecum and descending colon to the right kidney.

Bauereisen³ reports one such case which he calls perinephritis serosa. The infection came after a Wertheim operation, and followed the lymphatics along the ureter to the renal capsule, and gave rise to an inflammation of the tunica fibrosa and fatty capsule around the kidney.

In the acute infections, where there is insufficient drainage, it has been our custom to use the vaccines as adjuncts to surgical procedures. Where there is no obstruction, as in acute pyelitis, cystitis, orchitis, etc., of bacterial origin, the vaccines will give good results even in the presence of fever and severe pain. The vesical tenesmus, the polyuria and other inflammatory symptoms have been known to subside after several doses, especially when it was possible to identify the specific exciting organism. This is most forcibly illustrated in the colon bacillus infections. In the chronic cases without considerable obstruction the results depend upon the following factors:—

1. The ability to isolate the primary exciting cause.
2. The virulence of the infection.
3. The localization of the disease.
4. Individual response to treatment.
5. Origin of infection.

As has been pointed out under 'technical difficulties,' it is most essential that the primary exciting organism be isolated. This is doubly important and difficult in the bone and joint metastases of long standing. In such cases the primary organism may have entirely disappeared from the genito-urinary tract, or may have been completely changed by the presence of a mixed infection. If the organism cannot be isolated from the urine after repeated catheterization, preceded by prostatic massage, one must attempt to find it in the fluid or mural capsule of the joints into which the disease has passed secondarily. The difficulties are obvious, when one considers that it has been impossible to grow a culture of bacteria from aspirated joint fluid in our last 50 consecutive cases.

The location of the infection is an important factor. If the disease is in the bladder, where drainage is free and unobstructed, the infection will yield more quickly than when found in the pelvis of the kidney or in the various pockets of the prostatic gland or seminal vesicles, etc. Another factor not to be overlooked is the individual response to the injection. In this probably more than any other type of cases some patients show a decided idiosyncrasy towards the injection of foreign proteids. In some the reaction is so great that only small doses can be administered, while others may give little or no response to large doses. In some the polyuria and pain are increased after the injection rather than relieved.

The types of infection which we wish to discuss in this paper are:—

1. The localized infections, as in the bladder, kidney, urethra, etc.
2. The distal or metastatic infections in the joints, bones, and distal organs.

In our series of cases the infections of the bladder, kidney, urethra, prostate, epididymis and seminal vesicles have occurred in frequency in the order mentioned. As a rule, it is only in the acute cases that the infection can be found localized in one portion of the urinary tract. In the subacute or chronic stages the bladder, kidneys and prostate may all be involved simultaneously. In the metastatic infections we found the joints most frequently involved; occasionally the secondary trouble is found in bones and distal organs. The site of the primary infection must always be considered in the management of the arthritides.

A great variety of organisms are found in the infections of the urinary tract. Those most frequently encountered are the colon bacillus, the gonococcus, staphylococcus, and the streptococcus.

Ramsey⁴ reports a series of 100 cases, 90 per cent. of which were due to the colon bacillus. He also reported a series of 20 cases resulting from a diplococcus resembling the pneumococcus.

Thomson,⁵ on a basis of 71 cases, concluded that the greater per-

centage is due to the colon bacillus. He differentiates between the normal colon bacillus and the virulent organism. This infection, he says, is twice as common in children under ten years as in those older. Seventy-nine per cent. of the cases occurred in girls.

David⁶ reported cases of chronic cystitis, pyonephrosis and vesical tumors, and found colon bacilli and allied organisms in 60 per cent. of the cases, but in pure culture in only 30 per cent. Staphylococci were present in only 35 per cent. of the cases, and no two strains were identical in cultural characteristics. One case presented the unusual combination of the pseudo-diphtheria bacillus, streptococcus and pneumococcus. An anaërobic black pigmented Gram-negative bacillus was isolated in 4 cases. Anaërobic Gram-negative influenza-like bacilli were isolated in 4 cases, twice in pure culture. Other anaërobes were isolated as follow: Staphylococcus parvulus, *B. funduliformis* and Gram-positive staphylococcus.

Luetscher⁷ reported 2 cases of acute cystitis due to the *B. aërogenes lactis*. The first case occurred in a woman of twenty-eight, two months pregnant, and the second, a urethritis, in the woman's husband. Catheterized urines, taken on the sixth and ninth days, showed pure cultures of the bacillus. The author described the organism as an encapsulated bacillus with rounded ends, which did not stain by Gram's method. The morphology, capsule formation, absence of motility, rapid coagulation of milk, and gas formation leave no doubt as to the identity of the organism.

Oppenheimer⁸ observed 100 cases of pyelitis, the great majority of which were due to the colon group, and in 2 cases isolated an organism known as bacterium fecolinum alcolignes.

We had one case in which a pure culture of the *B. pyocyaneus* was obtained. The symptoms were not greatly marked, excepting the severe burning in bladder and urethra during the act of urination.

Hess⁹ carried on an experimental study concerning *B. coli* infections of the urinary organs. Injections of virulent cultures of *B. coli* were made into healthy bladders, and, in one instance, into a bladder previously irritated by an injection of turpentine oil. In the latter instance there ensued a severe cystitis with marked pyuria. The other cases suffered only a more or less marked bladder irritability or inflammation of the mucosa. Injection into the renal pelvis, without hindrance to the urinary stream, provoked only a bacilluria with a few leucocytes, but no alterations in the pelvis or the canal-systems. (This experiment corresponds with our clinical observation.) After artificial ureteral constriction, generally with a more or less persisting stasis (up to sixty-eight hours), severe damage followed, chiefly in the region of the pelvis and upper part of the ureter. The infection was invariably ascending

either through the canal or lymphatic systems. Intravenous injection with simultaneous artificial ureteral constriction gave rise to an infection of the ascending type in which the most marked changes were observed in the pelvis. In the unoperated side there were only minor, if any, alterations in the kidney.

In order to test the possibility of bacterial passage through the intestinal wall, an artificial ureteral stenosis was produced and opium administered for a long time. No renal infection was demonstrable, cultures from bladder and pelvis being negative. The conclusions are as follow: *B. coli* is an organism pathogenic for rabbits, capable of producing deep-seated lesions in the urinary apparatus, and a factor in concrement production. Of greater importance is urinary stasis, which, even in the presence of most insignificant alterations in the urinary passages, invites infection with the *B. coli* and increases its virulence. The infection corresponds to the ascending type. Descending infection is possible, but infection from the intestine is hypothetical only as long as there is no proof of transmigration of bacteria through the intestinal wall, either in conditions that are normal or described as "intestinal disturbances." The preponderance in women affected is due to local conditions (shortness of the urethra) which favor the ascent of the germ. In addition, there are a number of contributory conditions, as gonorrhea, loosening of the mucosa in the menses, and pregnancy. The unusual incidence in the right kidney is due to the anatomical structure, a predisposition of that kidney to lie abnormally low, in common with visceroptosis. In consequence, there occurs a more or less persistent kink which, by hindering the normal stream, affords the first step in kindling an infection.

Ohlmacher¹⁰ calls attention to a fact that has long been recognized, but which is of interest—namely, the concurrence of bacteriuria and urinary calculi. In reviewing the literature of bacterial therapy, he claims to have found no report, with the exception of 3 cases of Wright's, wherein the treatment of calculous bacteriuria and pyuria has been undertaken by means of autogenous bacterial vaccines. His case reports are incomplete, inasmuch as, despite the fact that the clinical manifestations disappear, the patients pass out of his hands before he succeeds in demonstrating the urine to be free from organisms. He concludes by stating that from the point of view of symptomatic relief, especially in the matter of distressful micturition and the accompanying failure of general health, he has been most favorably impressed in treating the sequelæ of renal calculus by the method of autogenous vaccine therapy. However, in several instances, he still found the offending bacteria in the urine, though present in greatly reduced numbers, even when a strict symptomatic recovery had been achieved.

"It is especially on this account, I believe, that a conservative attitude should be maintained relative to the possibility of preventing nephrolithiasis by bacterial vaccine treatment." In conclusion, he states that therapeutic immunization with autogenous bacterial vaccines should be attempted in non-operative cases of calculous pyuria and bacteriuria, for the relief of bladder irritability and impaired general health, and in the operated cases when these symptoms persist.

Pedersen¹¹ thinks vaccine treatment for the colon bacillus infections has been of little avail, because there are many varieties of colon bacillus so that isolation of the causative one is difficult.

Oppenheimer's conclusion that vaccines had no influence on the disease is of no value, since he used it only in 2 cases out of 100.

Green¹² thinks vaccines should be tried only in the obstinate cases.

Thomson advises vaccines and serums in the colon bacillus infections of the urinary tract in children.

Heath¹³ presents a case of acute cystitis of one month's duration, treated by an autogenous vaccine for seven days, followed by an absolute and permanent cure, without the use of urinary antiseptics or mechanical washings of the bladder. Heath gave subcutaneous injections: the initial dose fifty million staphylococci and twenty-five million bacilli; and twenty-four hours later drink is withheld for five hours to raise the bacteriotropic power of the blood, and with a view to increasing the frequency and producing tenesmus. This procedure was repeated at forty-eight and at seventy-two hours, after the inoculation, as much water as was required to relieve the symptoms being allowed between times. On the fourth day a second dose of vaccine, of one hundred million staphylococci and fifty million baccilli, was given, and forty-eight hours later drink was withheld for four to five hours, for the same reason noted above. The symptoms after the second inoculation gradually improved from day to day, and on the eighth day the symptoms had apparently disappeared altogether.

A third dose of one hundred and fifty million staphylococci and seventy-five million bacilli was inoculated on the evening of the eighth day, in order to make assurance doubly sure. From that day, now over three years ago, there has been no sign of the trouble. The urine has been normal and free from bacteria.

Vaccination for gonorrhea has met with an almost insurmountable obstacle—namely, the toxicity of the vaccines. Sensitized vaccines were attempted by some, but even these often gave violent reactions. Moreover, sensitized vaccines are not stable. Nicolle and Blaizot¹⁴ claim they have succeeded in entirely overcoming the toxicity of the vaccines and rendering them stable. They report 200 cases, 24 of which were ophthalmia, 25 orchitis, 3 'rheumatism,'

127 acute or chronic urethritis. Three cases of ophthalmia recovered after a few inoculations, thus avoiding any serious ocular complications. In orchitis cases the pain stopped a few hours or a day after the first inoculation. This rapid recovery prevented sterility. It is remarkable to note that their gonorrheal 'rheumatism' cases recovered very rapidly after from two to eight inoculations. A case is cited in which the patient, a woman, had suffered from gonorrheal urethritis for eight months, and recovered on the eighth day of treatment. Equally apparent was the action of the vaccines in acute and chronic urethritis; pain, cystitis and discharge stopped quickly, often after the third injection. None of their patients treated had orchitis, which would tend to prove that the vaccine prevents extra-urethral complications. In the treatment, Nicolle and Blaizot used one-half c.cm. of vaccine at each injection. Three millions of bacteria are diluted with one and one-half c.cm. of physiological salt solution. The injection is made intravenously or intramuscularly; it is painless and not accompanied by any febrile reaction. In acute cases injections are repeated every day or two days in chronic cases every two to four days.

The above citation of results does not correspond with our experience in gonorrheal cases. We have found the stock gonococcic vaccine worthless, the autogenous vaccine rather unsatisfactory, and the antigenococcic serum of some value in our cases of gonorrheal arthritis. Whether or not the report of the above-mentioned French authors is an instance of over-enthusiasm, we will leave those who have had more experience in gonorrheal cases to judge.

Schmutz¹⁵ treated a number of cases of gonorrheal epididymitis with antimeningococcic serum, and believes it to be justified by the morphological and biological affinities of the gonococcus and meningococcus. From a study of 52 cases, he concludes that pain is promptly relieved as early as the third hour after the injection. The injection sometimes causes a temporary rise in temperature, but the acute inflammatory symptoms and the edema subside in twenty-four to thirty-six hours. The effusion in the tunica vaginalis, if any, undergoes absorption sometimes in forty-eight hours, but more often in five or six days. The infiltration of the epididymis yields more slowly, a decrease in volume being noticeable only after three or four days. All induration disappears in from ten to eighteen days.

Schmutz reports 6 cases which were seen a few weeks after the treatment; in five the epididymis was perfectly normal. He found one injection (20 c.cm.) often enough; more than three were required only in exceptional cases. No anaphylaxis phenomena were ever noted. This method was found to be far superior to all other treatment, either by operative hyperemia or injection of colloidal silver. In his experience the injection of antigenococcic serum alone can compare with it.

Irons,¹⁶ in 1908, reported 31 cases of gonorrheal arthritis treated with good results with various strains of dead gonococci combined. The patients were almost invariably kept in bed during the treatment.

Shattuck and Whittemore¹⁷ discuss the specificity of the gonococcus vaccines and glycerine extracts. They have carried out a series of experiments on a limited number of patients. The first vaccine used was prepared from nine strains of bacteria which had been grown on artificial media for several months; the second, from fresh cultures. Both vaccines acted differently when given intradermically. In all cases the first vaccine reacted positively after it was a week old. Forty-six cases were tested by this method. The local reactions appeared in all gonorrheal and in nearly all non-gonorrheal cases. In 8 gonorrheal and 2 non-gonorrheal cases there were signs suggesting a general reaction. A focal reaction was observed in one case only, the diagnosis in this instance being gonorrheal arthritis. The results are attributed to autolyses.

It is stated that when a vaccine has undergone autolysis to an unknown degree, when changes in it may still be taking place, and when perhaps the peculiar proteins of the original organism may have been destroyed or modified, the results of the diagnostic tests and of treatment by such a vaccine may well prove unreliable; and if a specific reaction should occur, it may be masked by the effects of irritating or non-specific toxic products of disintegration of the bacteria.

These suggestions indicate that more knowledge is needed in regard to the changes that take place in gonococcus vaccine, and raise the hope that more satisfactory results may follow improved methods of preparing the vaccine.

The authors tested the same vaccine by the von Pirquet method, but did not obtain satisfactory results. Glycerine extracts and a control were then prepared and inoculations made by the von Pirquet method. The results obtained were somewhat better, but not satisfactory. The conclusions drawn were as follow:—

1. The concentrated vaccine showed no superiority for diagnostic tests.

2. In gonorrheal and in control cases it produced a local lesion like that of a chemical irritant. Autolysis may have been a factor in producing the supposedly irritating properties of this vaccine; the changes in the vaccine may have prevented it from producing a specific reaction, and the unsatisfactory therapeutic effects of gonococcus vaccine may, perhaps, be traceable to autolysis.

3. Glycerine extracts of the gonococcus, inoculated by the method of von Pirquet, caused, in a few cases, the formation of peculiar

papules which may have represented a specific reaction. Most of the cases showed no definite reaction.

Irons¹⁸ used the cutaneous inoculation of glycerine extracts in the differential diagnosis of metastatic joint lesions and in cases where he wished to prove the presence of a gonorrheal infection. He concludes that the cutaneous inoculation of glycerine extracts of autolyzed gonococci in patients infected by the gonococcus produces a well-defined reaction. This reaction is not usually obtained in normal persons, nor in those suffering from other infectious diseases.

In persons recently infected, the reaction is negative and increases gradually during the course of the disease.

In the more chronic forms of gonococcal infection, such as arthritis, the degree of the cutaneous reactivity varies from day to day, and these variations may be correlated with the changes in the clinical course of the disease.

Cases of severe infection, such as extensive arthritis, may give negative reactions. Later, when improvement has occurred, the reaction becomes positive.

In general, a positive reaction is obtained in patients with gonococcal infection at some time during the course of the disease.

In normal persons the gonococcin gives a cutaneous reaction rarely more than two to three millimetres in diameter.

Occasionally in adults and somewhat more frequently in children fairly marked reactions are met with where previous gonococcal infection can be excluded. In these cases the normal antibodies may be increased to an unusual degree. It is possible that normal individuals may be found who will give reactions to antigens prepared from many pathogenic organisms. The possibility must also be borne in mind that infection by one organism may give rise to an increase in the proteolytic power of the serum for other organisms.

The cutaneous reactions obtained with meningococcal and gonococcal antigens suggest that we are dealing with a group reaction.

In diagnosis, a positive reaction is to be regarded as confirmatory evidence of gonococcal infection. Other infections, such as those by the meningococcus or *M. catarrhalis*, which may give rise to a group reaction, must be excluded. The clinical value of the reaction must be determined by further tests, and its limitations defined by a study of many groups of cases. Komarowsky¹⁹ obtained good results from vaccine treatment in a case of vulvovaginitis, in gonorrhea of the epididymis, joints, prostate and Cowper's glands. In chronic gonorrhea the treatment was utterly ineffective. The gonococci never disappeared after pure vaccine therapy, and local treatment was necessary in order to get rid of them

entirely. (Our experience with gonococci has not been sufficiently extensive to prove it of great value in diagnosis.)

In May, 1913, we gave a preliminary report of our results, and since then have continued our treatment along the same line. The treatment of genito-urinary infections depends upon the proper diagnosis of the lesion. If the disease is localized in the genito-urinary tract, we must first endeavor to obtain a specimen of urine, from which the offending organism can be isolated. If the specimen contains a pure culture of bacteria, such as the colon bacillus, the vaccines are prepared at once and injected regularly and systematically. If a number of organisms are found, they are combined and made up into mixed autogenous vaccines and given in the same manner. Many authors have contended that each organism should be isolated and the mixture made of the various cultures. This causes a delay in the treatment, attenuates the vaccine, and compromises its efficiency.

We believe that heretofore our dosage has not been sufficiently large to obtain the best results. The initial dose, unless the vaccine contains one or more strains of virulent streptococcus, should be about one hundred million; unless the constitutional and focal reactions have been too great, a second dose of two hundred and fifty million should be given three days after the first. Thus the dosage may be increased rapidly up to twenty or thirty billion unless contraindicated by repeated severe reactions, loss of weight or a decrease in the coagulability of the blood. We believe that the blood picture has heretofore not been sufficiently watched. The injections should be made *deep* into the muscle (not subcutaneously) to avoid a severe local reaction. It is necessary to introduce the vaccine very slowly. When the dose is greater than ten billion, it is best to make two or three punctures, introducing about equal amounts into each area. If this method is objectionable, the vaccine may be given directly into the vein, in which case it should be diluted to five or ten times the amount of the intramuscular dose. It is our opinion that in a very short time all vaccines will be given intravenously.

In the vaccine treatment of metastatic infections from the genito-urinary tract, we meet with almost insurmountable obstacles. This is especially true when the primary focus of infection has almost or entirely disappeared. The difficulty of obtaining material for vaccines from the joints or distal lesions is known only to those who have attempted this procedure. In a long series of consecutive cases we have been unable to obtain a growth on culture from any of the material aspirated from the joints. There has been a great variance of experience along this line. Authors have reported positive growths in as high as 82 to 90 per cent. of cases; on the other hand, others have been able to grow bacteria in only 2 per

cent. of the same type of cases. This variance is due either to faulty technique on the part of the surgeon or laboratory man who reports a high percentage of findings, or to the fact that they have reported findings in far advanced cases in which the material has ruptured into the synovial sac, while others have probably had early cases in which the bacteria still lie in the subsynovial lymph spaces surrounding the joints as Murphy has shown. Our experience, as stated above, has taught us that it is practically impossible to obtain material for autogenous vaccine from the joint fluid.

When attempting to aspirate fluid from a joint, it must be remembered that bacteria can be carried into the needle and into the joint fluid from the skin, thus giving a positive growth, when in reality the fluid contained in the joint is sterile. To obviate such contamination, we have always made a preliminary puncture through the skin with a tenotome or other suitable instrument, thus permitting the needle to pass directly into the subcutaneous tissues. It must also be borne in mind that the aspirating needle and syringe must be sterilized by boiling and not by the use of chemical solutions. A small amount of the solution is always liable to remain in the needle or syringe, thus killing such bacteria as may be present in the joint fluid.

We believe that we will be able to get better results in the future from a procedure other than simply aspirating the fluid from the joints. It is our custom now, whenever possible, to resect a small portion of the synovial and subsynovial tissues surrounding the joint, and submit the same for bacteriological examination and culture. In one instance, at least, we were able by this procedure to isolate an organism in pure culture and make a vaccine.

In going over the histories of a large number of cases suffering from chronic arthritis, one usually finds a number of foci of infection, any one of which may have been the cause of the metastatic trouble. A case, for instance, will give a history of a chronic recurrent tonsillitis, and an examination will show tonsils with infectious material in the crypts or between the tonsil proper and the pillars. Upon further examination of the mouth one may find ancient tooth abscesses in the body of the tooth, or in the canal of the root, or numerous pyorrheal pockets. Upon examination of the urine in this same case one will find a large number of pus cells, indicating a pus infection somewhere in the urinary tract. It often requires a long study of the case to determine which one of these foci was the cause of the joint infections, or whether the arthritis is due to a mixed infection derived from one or all of these localizations. (It must be remembered that the clinical experience proves that many types of infection have the joints as the favorable sites of localization.) In a case of this type, of which we have had many, it becomes necessary oftentimes to make a

mixed or combined autogenous vaccine. Some of our arthritis cases gave histories of infections in the genito-urinary tract just prior to the beginning of the joint symptoms, but had no pathological urinary findings at the time when they presented themselves for examination. The primary infection had been cured by some other form of treatment. In just this type of cases it becomes necessary to use a combined vaccine, consisting of various strains cultivated in varied media of such bacteria as are known to cause the greater percentage of genito-urinary infections. Results in such cases depend upon whether one has present in the vaccine a strain most nearly resembling that which causes the original trouble. It requires large doses and vigorous and persistent treatment to get improvement.

In summing up our experience with vaccine therapy of the genito-urinary infections, and the sequelæ, especially the metastatic arthritides, covering a series of not less than 100 cases, our results have depended on one or more of the following factors:—

1. Our ability to isolate the organism or organisms directly or indirectly responsible for the infection.
2. Whether the infection was hematogenous, ascending, or from the lymphatic system.
3. Whether the lesion was acute or chronic.
4. Whether it was entirely localized in the urinary tract or had metastasized into distant parts of the body.
5. Whether the patients obtained the desired reactions from the vaccines and could be treated over a sufficiently long period of time to get results.

A detailed report of several patients will suffice to show the results obtained in some of our cases.

CASE I.—Mrs. J., *æt.* fifty. Came to the Hospital late in October, 1911, suffering from frequent painful urination extending over a period of ten months. She has had considerable treatment without any marked improvement. After taking an accurate clinical history, it was found that this patient had suffered from a dysentery of several weeks' duration, and that her trouble dated from that time and had become progressively worse. Cystoscopic examination showed no pus coming from either ureter, and the absence of a neoplasm or foreign body in the bladder. The mucosa of the bladder was greatly inflamed, especially in the region of the trigone. A culture from a catheterized specimen of urine made the diagnosis of cystitis due to the *B. coli* and staphylococci. Autogenous vaccines were administered about every five days, and the patient made a rapid and complete recovery and has remained permanently well.

CASE II.—Mr. D., came to the office on December 11th, 1911, giving a history of a continued illness for four months, with recurrent daily attacks of pain deep in the perineum, associated with chills and high temperature; frequent urination (every quarter to one hour), and large quantities of pus in the urine. Prostate gland not perceptibly diseased. Cultures from the urine show *B. coli* and staphylococci. Vaccines were administered and the patient improved rapidly for several weeks, followed by a period of non-improvement

for a few weeks. Another culture showed that all the staphylococci had disappeared, leaving a pure culture of *B. coli*, from which fresh vaccines were made in the usual way. This was in February, 1912. On April 1st, 1912, Dr. Murphy made the following note on the record: "The pains are all gone; only one morning urination. The urine is absolutely normal." (Case has been permanently cured; was operated for an acute appendicitis in July, 1914, at which time urine was absolutely normal.)

Ramsey is of the opinion that most of the acute cases recover completely, but are prone to relapses. We have had several such patients.

CASE III.—Mrs. G., suffering from a chronic cystitis, showed staphylococci, *B. coli* and streptococci in the urine. Autogenous vaccines were given at four-day intervals, and in a short time the number of pus cells decreased and those that were present were greatly fragmented. This patient made a complete recovery, but had a recurrence from which she also recovered.

CASE IV.—Mrs. M., had for years been suffering from an extremely painful arthritis, which had deformed both knee-joints and nearly all the joints of the upper extremities. The frequent and painful urinations from which this patient suffered and for which she had for years had bladder irrigations led us to the possible cause of the trouble. The examination of the urine showed a pure culture of a bacillus not unlike the *B. pyocyaneus*. Vaccines were given for about six weeks, resulting in a sufficient improvement to warrant the discontinuance of their administration. This patient has had two recurrences, and is under treatment at the present time.

CASE V.—Mr. B., *æt.* sixty-one, came to the office because of painful and swollen joints, with marked limitation of motion. His previous illnesses consisted mostly of painful and frequent urinations, for the relief of which he had had the prostate removed in 1907. In June, 1910, he began having dull aching pains in both shoulder-joints, which continued intermittently until February, 1911, when the pain became much more severe and the trouble extended to the joints of his hands, knees and the smaller joints of his feet. He came to the office on crutches and had difficulty in getting from the reception to the examining room. Examination of the urine showed thirty to forty pus cells to a 1/6 power microscopic field. Autogenous vaccines containing the staphylococcus aureus were made and given, with rapidly increasing doses, for over a period of about three months, at the end of which time the patient left the hospital and was able to resume his work.

CASE VI.—Mrs. C., *æt.* thirty. Entered the Hospital on account of a multiple metastatic arthritis involving nearly all the joints of both upper and lower extremities. She had not walked for six years. Upon careful examination, pyorrheal pockets were found about some of the double teeth; also ancient cavities beneath the fillings. Some of the teeth were extracted, and the sinuses in the gums healed, but the joint symptoms did not improve materially from the administration of the vaccine. Following this, vaccines were prepared from the urine, and the patient, for the first time in six years, was able to use her joints sufficiently to get about on crutches. This patient is under treatment at the present time, and has continued to improve, until now she is able to walk about with the aid of a cane.

CONCLUSIONS.

In concluding, permit us to say:—

1. That autogenous vaccines should be used in all cases when

it is possible to obtain them, but that there are cases in which there is a positive indication for combined vaccines.

2. That vaccines have failed in many instances because of the almost insurmountable difficulties in obtaining the proper organisms from the genito-urinary tract and from insufficient drainage of the infected areas.

3. That vaccines must not be expected to reconstruct tissues, organs or joints that have been destroyed by known or unknown pathogenic organisms. That they are prophylactic against such destruction, and to be effective must be timely and intelligently administered.

4. That vaccines should always be used, but that up to the present time we are not justified in neglecting other known methods of combatting infections of the genito-urinary tract and their sequelæ.

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COMPLETE VAGINAL EXTIRPATION OF THE BLADDER FOR MALIGNANT DISEASE, WITH A CASE.

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Advanced malignant disease of the bladder is a lesion that offers very little hope of permanent cure, but the inevitable later stages of this affection constitute one of the most distressing conditions known to medicine. No one who has ever seen a death from incurable disease of the bladder can doubt the desirability of obviating the sufferings which precede it. In the last stages of the disease comparative freedom from pain can be obtained in men by perineal drainage, or in women by the production of an artificial vesicovaginal fistula, but the discomforts which attend such drainage are in themselves so great and so disabling that this procedure is applicable only to the later stages.

When malignant disease is detected at so early a stage in its progress that it can be removed *in toto* by a resection of a part of the bladder wall and suture, this is usually the preferable procedure. The vast majority of all malignant neoplasms of the bladder are, fortunately, situated on the posterior wall, and in women a resection of any small portion of this wall is an easy and anatomically satisfactory operation; but when a large portion of the wall is involved, resection can hardly have any other result than the production of a vesicovaginal fistula, which indeed follows in some cases in the very early stages of the disease. When either primary disease or a recurrence after a resection has invaded so large a portion of the wall that resection is inapplicable, and when the patient is at the same time constitutionally so far capable of activity that a vesicovaginal fistula is undesirable, extirpation of the entire bladder and the formation of an artificial reservoir is an expedient that is worth considering. If the disease has not extended beyond the bladder at the time of the extirpation, there is indeed some prospect of a permanent freedom from recurrence; and when the operation was first proposed this was held to be one of the reasons for its performance. Unfortunately the death-rate from uremia, consequent on ascending infection of the kidneys from the artificial reservoir, has proved in practice to be so large that the hope of any essential prolongation of life is not very great. There can, however, be little question but that the exchange of a death from cancer of the bladder for a year or two of fair health, with a painless death at the end of it, is well worth the risks and discomforts of an operation, even

without the side chance of an escape from serious infection of the kidneys. The case which the writer reports seems worth putting on record, both because it is one more instance of an operation which has been performed but seldom, and because the technique employed in this case was somewhat unusual, if not unique, and has some advantages as well as some disadvantages.

The patient, R. A., Russian, forty-two years old, married twenty years, and the mother of five children, entered the writer's service at the City Hospital, August 20th, 1901, complaining of frequent and painful micturition and gross hematuria of about three months' duration. She was in very fairly good general condition, had not lost flesh, and was doing her housework. On examination of the urine the excess of normal blood globules was so great as to obscure the detection of anything else, but no renal elements were found.

A cystoscopic examination demonstrated the presence of a small protruding mass on the right posterior wall, surrounded by a thickened zone, which approached closely to both ureteral orifices and extended upwards to a point which was judged to be at about the level of the uterovesical reflection of the peritoneum. A portion of the growth was removed for pathological examination and reported as alveolar sarcoma. A second cystoscopic examination, two weeks after the first, showed the growth perceptibly enlarged and progressing upward along the posterior vesical wall, the patient meantime being up and about the ward, and apparently in very good health, pulse and temperature normal. Her urination, however, was very frequent and evidently very painful.

It was evident that a resection of the bladder at a point beyond the limits of the disease would leave little or no reservoir and so large a defect in the wall that the possibility of its repair was very problematic. Complete extirpation of the bladder and the formation of an artificial bladder out of the vagina looked the more rational procedure and was determined upon.

On September 21st, with the patient in Sims' position, the anterior vaginal wall was incised by a transverse cut leading immediately in front of the cervix and extending across the whole width of the wall. A second incision was carried from the middle of the first downward along the median line of the anterior wall to a point somewhat below the neck of the bladder, thus exposing the upper portion of the urethra. The bladder was then separated from the vaginal wall and uterus by blunt dissection, with the usual ease, as far as the uterovesical reflection of the peritoneum. From this point on the bladder is normally attached to the peritoneum by extremely loose connective-tissue and should separate with the greatest ease, but in this case it was for some reason intimately adherent to the peritoneum and was separated from it with great difficulty. The peritoneum was, in fact, torn several times, but in each case the

rent was immediately repaired with suture or ligature. On referring to published accounts of other extirpations of the bladder, the writer has found no other instance in which this difficulty was met with; and although he has found no other account of a vaginal extirpation, he is confident that this difficulty was peculiar to this case and would probably not be met in another. At about the top of the bladder the adhesions terminated, and the remainder of the separation from the peritoneum was accomplished with the greatest ease.

This stage of the operation is greatly facilitated if a large portion of the bladder wall is gripped in forceps and drawn strongly downward. This can be accomplished without laceration of the wall if the portion seized in the forceps is large enough.

At this point the bladder was divided into two lateral halves with the idea of facilitating the separation from the anterior tissues, but this the writer believes to have been a technical mistake. In the first place the malignant growth was of necessity divided, and this no surgeon would to-day care to do, but at the time of this operation the danger of reinfection had not become clear in our minds; in the second place, the separation of the bladder from the anterior tissues by blunt dissection with the finger proved to be so extremely easy and bloodless that its division was plainly unnecessary. The neck of the bladder was clamped, and cut across below the clamp about a quarter of an inch above the internal orifice.

The separation of the bladder from the anterior vaginal wall and lateral tissues having been made by blunt dissection from above downward, the ureters had, of course, been left in contact with the vaginal wall and separated from the bladder to the points of their entrance into it. The bladder was now attached to the patient only by the ureters, each of which was divided a short distance above the bladder wall, thus completing the extirpation.

In planning out the operation beforehand, the writer had expected to free the ends of the ureters, bring them through slits in the anterior vaginal wall, and make such a repair of that wall as seemed likely to construct the best vaginal reservoir and afford the best drainage for the cavity from which the bladder had been removed; but at the completion of the extirpation the condition was that of a cloaca and the halves of the anterior vaginal wall were so far retracted as to be evidently of little importance. The ends of the ureters were plainly visible and appeared likely to open satisfactorily on the lateral wall of the cloaca. There had been no hemorrhage of importance from start to finish and the cavity was now dry with the exception of some bleeding points along the cut edges of the vaginal wall. These were controlled by stitches, and the

whole cavity was packed with gauze, the ureteral leaks being visible just below the packing.

The pathologist's examination of the bladder as a whole resulted in a change of diagnosis to carcinoma. It will be noticed that the specimen originally submitted was from the superficial part of the growth; while at this second examination the base of the growth was available for section.

There was but little shock. The patient returned to bed in good condition. On the following day she complained of moderate suprapubic pain which lasted about twenty-four hours. The gauze was removed and replaced daily; the cavity remained clean. The most satisfactory dressing on the whole seemed to be gauze wet with myrrh. Convalescence was uneventful, but in the second week there were numerous attacks of moderate and severe pain in the lower abdomen*and left flank, at which time there was an abrupt rise of temperature to 102° F., which, however, subsided promptly. There was little, if any tenderness over the left kidney, and no other symptoms, but it was regarded as probably a pyelitis. It will be noted that the absence of all vesical symptomatology deprives the observer of the most prominent of the ordinary symptoms of a pyelitis.

On October 14th, twenty-four days after the operation, the patient was in good condition in every way, and it was decided to close the vagina. This was done by denudation of the entire vaginal surface to a point just below the internal orifice of the urethra and to a corresponding height on the posterior and lateral walls. The upper part of the wound was brought together by buried cat-gut sutures and the lower portion by external silkworms. A soft rubber catheter was tied into the urethra and left until November 2nd, eight days after operation, when it was withdrawn and the patient passed urine voluntarily, the quantity being usually about 10 oz.

Within a few days after the withdrawal of the catheter the temperature became slightly elevated, running between 99 and 100° F., but the general condition steadily improved until the middle of the third week after the second operation when for about ten days she ran a distinct pyrexia with pain and tenderness in the right flank. Owing to the absence of the bladder there was again no urinary symptomatology, but the attack undoubtedly represented a right-sided pyelitis. Examinations of the urine were not satisfactory, being obscured by the cloacal elements, but no casts were found—they were probably present, but missed. During this time the patient at first gained in general condition in spite of the pyrexia, but later had some nausea and vomiting, and looked cachectic. The blood count was essentially normal; the urinary secretion varied from 20 to 60 oz. daily, usually between 30 and 50. No renal elements were found at any time. She was discharged at the end of

twelve weeks with normal temperature, in fair general condition, and free from discomfort.

Some weeks later, on January 14th, 1902, she entered the writer's service, at the Free Hospital for Women, with a small perineal fistula and some nausea and vomiting. She was examined with the cystoscope, both ureteral orifices were detected, and the right was catheterized for examination of the urine. The left orifice was narrow and would not admit a catheter. The urine was examined by Dr. E. S. Wood, and had the general appearance of a pyelitis. After a few weeks in the hospital under careful diet and general attention, the patient had improved greatly in every way. The left ureteral orifice was then dilated with bougies to full size, and on March 18th the perineal fistula was repaired. This operation failed, but a second one two weeks later was successful. She returned home in very fair condition and did her housework, but died of uremia in July, eleven months after she was first seen.

This patient had entire control of the urine from the vaginal reservoir, and when she wished to expel it passed a surprisingly strong stream. She was repeatedly tested on this point when lying on her back and could expel the urine with so much force that it reached a basin at a distance of about 15 in. from the meatus. The capacity of the reservoir was about 8 to 10 oz.

The net result of this case was only partially satisfactory. The patient obtained euthanasia; she never suffered from the distressing strangury which is characteristic of malignant disease of the bladder; but she lived only eleven months, and the failure of the first perineal repair, together with the attacks of pyelitis, led to her spending the greater part of this time in hospitals. It was about the result which has usually been obtained by turning the ureters into the rectum and utilizing this viscus as a reservoir. It is, however, to be said that this woman was an extremely ignorant and careless person, and that nothing could convince her of the necessity for expulsion of the urine at stated intervals in the absence of urinary desire, so that the ureters were undoubtedly subjected to back pressure and dilatation at frequent intervals. During the periods when she was at home, this was, so far as could be ascertained, almost continuous.

There was no return of the malignant disease, and with a more intelligent woman who was careful to empty the reservoir at intervals of not more than two hours there might well have been much greater prolongation of life. As a whole, on review of the case, the writer believes her fate to have been preferable to that of those women he has seen with malignant disease of the bladder treated in other ways.

Questions of technique seem to the writer, however, the most interesting points in the report of the case, and of these there are several.

The uterus has usually been removed by hysterectomy as a preliminary to extirpation of the bladder. This has been done on theoretical grounds. One of these has been that the uterine secretions would tend to set up decomposition in the urine and favor the infection of the kidneys. There does not seem, however, to be any ground for belief that this secretion would be any worse in this respect than the secretions of the vagina which are necessarily left. Second, it has been held that in the event of over-retention of the urine this would be forced upward into the uterus and excite endometritis and salpingitis. This was, as has been said, from the unintelligence of the patient, a case of most extreme, habitual, over-retention, yet there were no symptoms which would suggest injury to the uterus or tubes. When the malignant disease originates in the uterus and invades the bladder secondarily, the removal of the uterus with the bladder is, of course, necessary, but when, as in this case, the disease is primary in the bladder, this result would argue that the additional dangers of a hysterectomy are unnecessary.

Extirpation of the bladder has usually been performed per abdomen. This operation the writer has never had occasion to do. From his experience with this case and from the reports of the abdominal cases, he would judge that the vaginal extirpation was but little more difficult and with further experience might prove no more difficult than the abdominal. It involves less shock and must somewhat lessen the risks, since there is no contact between the peritoneum and the necessarily abnormal urine, of which there must of course be somewhat more danger by the abdominal route.

The complete division of the anterior vaginal wall by a T-shaped incision, with the subsequent retraction of the flaps, resulted in a rather surprisingly large and satisfactory reservoir. Some better method of disposing of the ends of the ureters might perhaps have been found, but the subsequent appearance of their orifices on cystoscopic inspection of the reservoir was rather surprisingly normal; although, as has been noted, one of them was obstructed by cicatricial contraction. It was, however, easily re-dilated. That the patient had complete control of the urine was probably due to the fact that the bladder was removed at a point just above the internal orifice of the urethra and that trauma to this was carefully avoided. The expulsion of the urine was, of course, effected by conscious effort with the abdominal muscles.

In the present state of our knowledge the surgical treatment of these cases of advanced malignant disease of the bladder is at best unsatisfactory. The hopes once held that complete extirpation of the bladder and utilization of the vagina as a reservoir would result in radical cure, and an indefinite prolongation of life in a state of reasonable comfort, have not been realized in any case which the writer has seen reported, but as an expedient for euthanasia it

seems to him to be worth more consideration than it has received.

It should also be borne in mind that the operation has been performed but very few times and that with a larger experience some percentage of really successful cases might occur.

In another case of this character the writer would not be disposed from our present information to hold out any great hope of prolonged life, but if the disease had gone too far to permit of a hopeful resection, and the symptoms were distressing, he would still regard it as the best method of obtaining euthanasia.



Fig. 1.



Fig. 2.

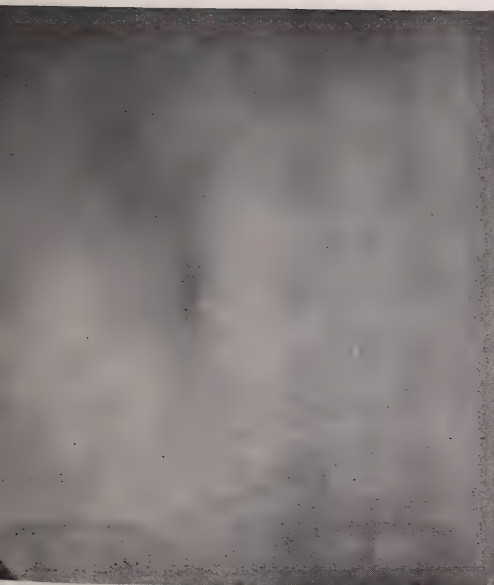


Fig. 3.



Fig. 4.



Fig. 5.



Fig. 6.



Fig. 7.

ASPECTS OF RENAL AND URETERAL LITHIASIS.*

By EDWIN BEER, M. D., of New York.

In writing this paper, the writer does not propose to review the whole subject matter of renal lithiasis, but proposes to touch upon some of the interesting aspects of this disease, calling attention to the unusual. This is all the more useful to the general reader, as the time-worn typical cases are readily recognized and treated.

The first point that the writer wishes to illustrate from cases in his experience, is that stones of large size, *i. e.*, any size, for at one time the large ones were small, can occupy a position in the kidney pelvis extending into the calyces, without causing any focalizing subjective symptoms (Cases I and II), or with the fewest symptoms such as only mild backache (Case III).

CASE I.—M., *æt.* thirty-five; may have passed a stone ten years ago. Since two and a half years has had distinct discomfort and pains in the perineum, also occasionally very mild soreness in both loins. He suffered from mild diurnal increase in frequency. Physical examination was negative. Urine contained some pus cells and some red cells.

Cystoscopy showed a normal bladder. Urethroscopy showed edematous verumontanum and submucous hemorrhagic area along side of it. Some exudate is present in the posterior urethra. The urines from both kidneys were clear and sterile.

Right kidney: urea 0.6 per cent., epithelial, few pus and few red cells. Left kidney: urea 1.6 per cent., epithelial, no pus and no red cells. X-ray pictures showed a calculus in the right kidney. The diagnosis being thus cleared up the patient refused operation, as he felt too well and doubted the presence of the diagnosed stone. About one year later he came back, stating that ever since leaving the hospital he had had intermittent attacks of pain, distinctly localized to the right lumbar region. Three months before readmission, he had had three attacks of hematuria. Physical examination negative, as on first admission. Right kidney: urea 0.8 per cent., occasional red cell. Left kidney: urea 1.6 per cent., few epithelial and white cells. Both sides sterile. X-ray as before (Fig. 1).**

February 24th, 1913, nephrotomy; calculus removed and kidney sutured. Calculus mostly calcium oxalate and magnesium phosphate with small amount of calcium carbonate. March 12th, 1913, discharged; wound closed; cured.

Remarks.—This patient as seen in the x-ray picture had a stone of fair size in his kidney, which remained quiescent until some local change was produced following the ureteral catheterization. The chief complaint had turned our attention to the prostate, and it

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**All x-rays except Fig. V were taken by Dr. Jaches. Fig. V was taken by Dr. Cole.

was thought that the patient was troubled solely with a mild prostatitis. There was no suspicion of a renal condition, until the routine x-ray examination and the examination of the separated urines called our attention to the renal stone.

CASE II.—M., *æt.* sixty-one. About two and a half years ago urine contained brick-dust sediment, and patient had suffered from attacks of retention. Then well until ten months ago, when burning on urination set in and urine became cloudy. Since ten months has had attacks of burning in the penis with dirty urine. No pains otherwise. Of late bloody urine and attacks are more frequent. Following cystoscopy, done recently, had drawing pains along the course of the left ureter. Physical examination is negative. Urine contains pus and red blood-cells. Cystoscopy shows marked cystitis—inflamed left ureteral meatus—poor excretion of indigo-carmin from left kidney and good excretion from the right. Left kidney: trace of albumin, urea 0.3 per cent., fair number of red and pus cells.

Right kidney: very faint trace of albumin, urea 1.3 per cent., occasional red and pus cell. Bacteriologically both sides are infected. X-ray was not conclusive. There were no distinct shadows.

July 17th, 1912, nephrectomy for pyonephrosis due to a large calculus. August 13th, 1912, discharged cured.

Remarks.—In this case the bladder picture dominated. The patient never had any pain or discomfort referable to his diseased kidney. Despite this the involved organ was almost completely destroyed.

CASE III.—M., *æt.* sixty-four. Thirty-one years ago passed gravel. Has had frequent attacks of gonorrhea and thirty-six years ago had a specific chancre. Since ten years, frequency by day and night. Six years ago hematuria. This was repeated last year and again one month ago. 'Weakness' in the back has also been noted. Physical examination was negative except for enlarged prostate. The urine contained albumin and many white and red cells. The patient developed a septic rash of hemorrhagic type and retention of urine, which owing to a stricture of his urethra could not be properly relieved. Suprapubic cystotomy was performed, and after the patient had thoroughly recovered, the prostatic adenoma was enucleated. The suprapubic wound refused to close, despite the fact that the urethra had been dilated up to 30 French. Cystoscopy showed a secreting left kidney and a right kidney that discharged only pus. X-ray examination (Fig. 2) showed a large branching calculus in the pelvis and calyces of the right kidney. Despite low urea excretion, 0.3 per cent. from the left kidney, as well as low 'phthalein (inestimable), and in view of the fact that the patient was evidently living on this organ, the other being dead, on June 25th, 1913 nephrectomy of right kidney was done for calculous pyonephrosis. The patient made a good recovery and the suprapubic wound closed.

Remarks.—This patient, though he had been carrying a very large calculus for a long time, complained primarily of his prostatic obstruction and was only occasionally cognizant of mild backache, presumably due to his renal calculus.

The second point that the writer wishes to allude to is as interesting as that just discussed and illustrated, but occurs less frequently. The patient has a stone in one kidney, but all his pain is

on the other side. This same phenomenon is seen in other conditions as well as in lithiasis, and in view of its occurrence one must be guarded in the interpretation of kidney pains. This reno-renal reflex from a diseased to a healthy kidney—proved definitely in the clinic and in the laboratory—makes all attempts at accurate functional work, in supravescical asymmetrical disease, of very questionable value.*

CASE IV.—M., *æt.* twenty-five; sick three months with bloody urine. At first no pain, later dull ache in the right lumbar region. For past month continuous pain, occasionally cramp-like in the right side. No pain in the left side. X-ray examination had been without result. Physical examination was negative. Urine contained many red cells, and was distinctly bloody.

Cystoscopy showed a normal bladder with bloody urine coming from the left ureter while the right was secreting clear urine. While under observation the bleeding continued and the pain was always on the right side, never on the left. An *x*-ray examination made in the hospital showed a calculus in the left kidney (Fig. 3).

Nephrectomy for calculous pyonephrosis (left) was performed. The patient made an uneventful recovery and all the right-sided pains disappeared at once and the urine became clear.

Remarks.—This patient had all his pains in the right side, although his left kidney was diseased. In fact when he came to the writer for treatment, he told him that his last physician wished to operate on the right kidney, where he complained of pains. This case also illustrates the fact that pelvic stones may cause continuous bleeding, a symptom otherwise seen in the problematical, essential hematurias and in neoplasms. The great value of cystoscopy and ureteral catheterization is clearly shown in this case.

The third point that the writer wishes to emphasize has been repeatedly mentioned in recent years. Nevertheless, mistakes are still made. In renal lithiasis pains may be so referred by the patient that the unwary thinks he is dealing with a disease of another organ. This occurs usually on the right side, and the mistake in diagnosis usually leads to an appendectomy. Such cases are not at all uncommon, as the differential diagnosis, without an *x*-ray examination, is often impossible, and at times even with the *x*-ray examination one may go astray, as cases of the two diseases combined have occurred. Moreover, when the inflamed appendix lies close to the ureter it may produce a very misleading group of symptoms.

CASE V.—F., *æt.* eighteen; one and a half years ago operated upon for appendicitis. Ever since operation has pains in region of scar. Attacks of

*Much of the literature bearing on these points can be found in the following papers by the author: The Present Status of Blood Cryoscopy in Determining the Functional Activity of the Kidneys (*Amer. Journ. Med. Sciences*, February, 1906); The Phloridzin Test, with Special Reference to the Influence Exerted by a Diseased Kidney on the Excretory Work of the Second Organ (*Journ. Amer. Med. Assoc.*, Vol. 50, 1908); Discussion on Functional Tests (Meeting, American Medical Association, Atlantic City, 1912).

vomiting, fever and chilly sensation. Attacks recur every one to two weeks and last two to four hours. Physical examination negative except for the scar (primary union) of the appendix operation and palpable movable right kidney. Urine contains considerable pus and some red cells. Cystoscopy showed hyperemia about the right ureter meatus, otherwise normal bladder. Urine from the right kidney turbid; 1 per cent. urea, staphylococci in culture, many pus cells, albumin marked reaction. Urine from the left kidney was clear; urea 1.2 per cent., sterile, very few white and red cells; trace of albumin. X-ray showed a stone in the pelvis of the right kidney. Pyelotomy and removal of calculus, followed by complete relief.

CASE VI.—M., *æt.* thirty; operated upon seven years ago for appendicitis. Despite operation patient has had some pains as before. Urine has become cloudy, contains red cells. No hematuria. Three years ago severe colic and passed sand. Cystoscopy; bladder is normal. Right kidney: urea 0.3 per cent., some pus and red cells, sterile. Left kidney: urea 1.04 per cent., sterile. X-ray examination (Fig. 4) showed a fair-sized triangular stone in the pelvis of the right kidney. On July 23rd the patient was operated upon, and the stone readily removed by pyelotomy. The recovery was uneventful and the relief complete.

Remarks.—These cases illustrate very well the referred pains of renal pelvic calculi; and the importance of remembering such cases when diagnosing appendicitis is self-evident.

The fourth point that the writer would like to touch upon is the comparatively slow growth of some calculi which are left undisturbed in the kidney as well as the importance of not delivering the kidney in cases of bilateral extensive disease.

CASE VII.—M., *æt.* fifty-two. May, 1901, right nephrotomy for stone. Well for five years; then colic in left side. Colics every four months in left side and x-ray taken in 1907 (Fig. 5). In 1910 right-sided colic, and passed stones. In 1911 palpation of the left kidney region revealed crepitus. In 1912 x-ray again taken, and though five years have elapsed since the previous picture, the stones are only slightly larger (Fig. 6). Moreover, the x-ray showed a stone in the right kidney. The catheterized urines showed plenty of pus and red cells on both sides. Urea 0.9 per cent. on the right and 0.5 per cent. on the left side.

January 3rd, nephrotomy and removal of calculi from the left kidney *in situ*. The organ was exposed with considerable difficulty and incised *in situ*. Its lower half was the seat of multiple miliary abscesses. The kidney was drained. Recovery was uneventful, the fistula closing slowly. The patient continues in good health.

Remarks.—The pictures show to what size calculi can grow in the renal pelvis and how gradual their growth may be. In addition, this case illustrates the importance of not delivering the kidney when the second organ is badly diseased or absent. The risk attending the luxation of such an organ is too great, and any accident that might occur might force the operator to sacrifice the affected organ, thus depriving the patient of useful (perhaps needed) kidney tissue. The incision *in situ* was simple and the bleeding was easily controlled. Another fact illustrated by this case is the readiness with which nature, after a nephrotomy will dispose of miliary abscesses

of the kidney. In other cases stripping of the capsule will lead to a cure, as the writer has seen in one case where the kidney was removed by mistake forty-nine days after decapsulation for septic hemorrhagic infarcts and the organ was found to be absolutely normal. Other cases get well without any operation, whereas others again, the hyperacute cases, demand nephrectomy.

A fifth point that the writer would like to touch upon is the wandering of calculi. According to Fränkel, there are only 25 cases on record of calculi that have wandered through the ureter. Eight wandered into the pelvis, seven into the lumbar region. Of this kind of wandering, which occasionally happens both with renal and biliary stones, the writer has seen no instance, and to this he does not refer. The wandering down toward the bladder and back toward the kidney concerns us here. There can be no doubt that the majority of small stones, which get started in their descent toward the bladder, reach there more or less slowly and are voided. Of such cases the writer sees a fair number every year. At times they are arrested for months, in transit, and if they cause serious symptoms they have to be removed. Such calculi are seen remaining in the ureter for five months or more without destroying the kidney function, which can be explained only by the fact that they do not block the ureter completely. Experiments on dogs have shown that a complete obstruction of more than four weeks practically destroys the functional capacity of the corresponding organ.*

The wandering toward the kidney, that is from below upward, is fortunately a much rarer occurrence, and the importance of realizing such a possibility is very evident as illustrated in the following case.

CASE VIII.—M., *æt.* twenty-nine, has had right-sided colic for four years, accompanied by hematuria. Cystoscopy shows a normal bladder. There is slight peri-ureteral injection. No indigo-carmin excretion from the right ureter and very faint discharge from the left (inhibition). Following the cystoscopy the urine was collected as voided and the indigo never appeared in the proper concentration. Physical examination showed some tenderness over the right ureter. The urine contained a trace of albumin, few hyalogramular casts, occasional white and red cells. X-ray taken July 13th shows a diamond-shaped calculus, about $\frac{3}{4}$ in. long and $\frac{3}{8}$ in. at its widest, in the lower ureter at or near its orifice into the bladder.

Before operating for this stone on July 17th, a confirmatory exposure was made. This x-ray shows a shadow of the same size and shape as the x-ray of July 13th, but now it is in the path of the ureter between the transverse processes of the fourth and fifth lumbar vertebræ. The shadow in the lower end of the ureter has disappeared from this position (Fig. 7). July 17th, ureterotomy (lumbar) and removal of calculus of the size and shape seen in the x-ray plates. August 1st, discharged cured.

*Beer: Experimental Study of the Effects of Ureteral Obstruction on the Function and Structure of the Kidney. (*Amer. Journ. Med. Sciences*, 1912.)

Remarks.—This case illustrates the importance of taking an x-ray just prior to the operation. An anterior incision planned on the evidence of the first plate would have been useless, as the stone wandered up to the lumbar region. The very faint indigo excretion from the second kidney points again to that peculiar 'reflex' inhibition of which the writer has spoken above, and which is seen quite frequently, without there being marked permanent functional disturbance.

A sixth point, that the writer would like to call attention to in this somewhat disjointed paper, is the importance of cultural study of the separated urines before operation. In his experience this has proved very useful, and depending upon the bacteriological reports he is guided in operating. If the urine is sterile, he feels that he can sew up the nephrotomized kidney. If, however, there are bacteria present in the specimen (last drops taken are examined culturally), he prefers to drain. The following case illustrates what may happen if such a kidney is sewed up in the face of infected urine.

CASE IX.—M., *et.* twenty. In April, nephrolithotomy (R). This operation did not relieve the patient; readmitted in November, complained of frequency, pain in right lumbar region and cloudy urine. Examination disclosed a large, tender right kidney. Urine contained a heavy trace of albumin, many pus cells. X-ray showed a large right kidney and a suggestion of a stone. Cystoscopy showed a normal bladder. Right kidney: urine cloudy, heavy trace of albumin, 0.5 per cent. urea, many white blood-cells, few red cells. Left kidney: urine clear, very faint trace of albumin, 1.3 per cent. urea, occasional white and red cells.

Specimen from the right kidney showed staphylococcus aureus, but by some mistake the preliminary report was that the urine was sterile. November 22nd, nephrotomy and decapsulation. Kidney was sutured. Patient instead of convalescing normally, ran a typhoidal course, with temperatures as high as 104° F. December 27th, nephrectomy was performed for pyelonephritis. Pathological report: extensive purulent interstitial nephritis with miliary abscesses. After this operation the recovery was uneventful.

Remarks.—If this kidney had been drained instead of being sutured, it is more than likely that the patient would not have lost this organ. In relying on these bacteriological indications one must avoid the preliminary administration of urinary antiseptics, as they may render urine, obtained from the kidney that is to be operated upon, sterile, and thus mislead.

On the other hand, the following recent experiences, where the urine was sterile, show how smoothly the cases recover without drainage, the kidney incision being sewed up.

CASE X.—M., *et.* thirty-three; complaining of frequent urination for the last thirteen years. Since six years pains in the right lumbar region. Two years ago passed a stone. Has had hematuria twice. Examination showed tenderness over the left costovertebral angle. Urine contained a few red cells and a faint trace of albumin. Total urea for twenty-four hours on full

diet on two successive days: 13.2 grm. (1.2 per cent.), 14.4 grm. (0.8 per cent.). 'Phthalein in two hours, 35 per cent. Cystoscopy was negative. Right kidney: heavy trace of albumin, urea 1.05 per cent., moderate number of white cells. Left kidney: heavy trace of albumin, urea 1.10 per cent., very many red cells. Both sides are sterile. X-ray showed a stone in the left kidney. June 4th, nephrolithotomy and suture of the kidney. Tube drain to kidney. June 16th, discharged, wound completely closed.

CASE XI.—M., *æt.* thirty-one, complains of pain in left loin. Examination showed tenderness in the left lumbar region. The urine contained a few red cells. X-ray examination showed a calculus in the lower pole of the left kidney. Cystoscopy showed a normal bladder. Right kidney: urea 1.4 per cent., very faint trace of albumin, occasional white and epithelial cells. Left kidney: urea 1.7 per cent., albumin 0, moderate number of white and occasional red cells. Bacteriologically both sides are sterile. December 30th, nephrolithotomy and suture of the kidney, with rubber tube drain to the kidney. January 20th, discharged healed.

In the foregoing pages the writer has tried to touch on a number of the problems connected with the diagnosis and the treatment of stones in the kidney and ureter, without in any way exhausting this very interesting and most extensive subject, which unfortunately is an all too common disease. Every year dozens of these cases present themselves, and often after having been unrecognized by their physicians who fail to avail themselves of the more modern methods of diagnosis. The future of lithiasis of the upper urinary tract must make for early diagnosis before the involved kidney is destroyed by pressure atrophy or secondary infection, and also for the elucidation of the etiological factors, so that stones may be prevented from forming and reforming.

PRIMARY TUBERCULOSIS OF THE PELVIS OF THE KIDNEY.*

By LEO BUERGER, M. D., F. A. C. S., of New York,

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The question as to the exact place of primary invasion of the kidney in chronic renal tuberculosis has been a moot one for years, although the consensus of opinion to-day seems to favor the pyramids as the site of predilection. In the course of studies on the pathology of surgical diseases of the kidney, we have had occasion to see quite a large number of specimens of renal tuberculosis, amongst which, however, the advanced type of lesion with cheesy degeneration and cavity formation, was by far the most common. In a study of 50 tuberculous kidneys received in the Department of Surgical Pathology of the Mt. Sinai Hospital during the last seven years (from 1907 to 1914) the variety with primary involvement of the papillæ was frequently encountered. In two specimens, the lesions were so little advanced from the anatomical standpoint, and were so suggestive that the calyces and pelvis were the first to be attacked by the infection, that it may be of value to describe them here.

Before analyzing the findings in these 2 cases, let us briefly review the salient points of the pathology of renal tuberculosis, so that the significance of our own observations may be clear.

It will be remembered that renal tuberculosis has been described, by various authors, as occurring in certain typical forms, the gross anatomical changes serving as a basis for the classification. Thus Israel recognizes three types, each of which has certain distinct morphological features, as well as certain characteristic differences in symptomatology and prognosis. They are (1) the cavernous, cheesy form, (2) the ulcerative tuberculosis of the papillæ, and (3) a chronic nodular, tuberous variety, which is to be distinguished from the acute miliary form by its unilaterality, its chronicity, and the large size of the lesions.

Legueu in his book on urology** speaks of six types. (1) Miliary tuberculosis; (2) nodular tuberculosis localized by preference in the cortical substance, but occasionally in the medulla; (3) the ulcerocavernous form, the most common and so-called surgical variety,

*From the Department of Surgical Pathology, Mt. Sinai Hospital.

***Traité Chirurgical D'Urologie*. Paris. 1910.

in which the organ contains a variable number of cavities; (4) massive tuberculosis; (5) tuberculous hydronephrosis; and (6) polycystic renal tuberculosis.

The results of histological investigation have led to the opinion that in chronic renal tuberculosis the papillæ are as a rule first invaded. Certain authors believe that the medullary rays may also harbor the primary focus. Here a closed lesion is produced, perforation into the calyx being the ultimate outcome. This, however, is probably a rare form of lesion.

The most recent exposition of the pathology of early tuberculosis of the kidney is given in a thorough and scholarly paper by Wegelin and Wildbolz,* who examined thirteen tuberculous kidneys with the purpose of investigating the site and character of the earliest microscopic and macroscopic changes. On gross examination, they found localization in the papillæ to be most common, the lesion manifesting itself as cheesy foci or small ulcerations and cavities—all these being but different stages of the same process. In 5 cases only one papilla was involved; two in 3 cases, and several in the rest.

Microscopic studies revealed the interesting fact that although the papillæ seemed primarily invaded, the first evidences of tuberculous infiltration were to be sought in the lateral portions and not in the apices of the papillæ, as is commonly believed to be the case. Synchronously with this lesion there occurs the development of tuberculosis in the adjoining calyx, particularly in the recesses formed by the calyces and pyramids. In the pelvic tissue the process is subepithelial, being sometimes further advanced in an adjacent papilla, at other times most mature in the calyx wall.

Elsewhere in the literature opinions vary, the preponderating view being in favor of a primary involvement of the renal parenchyma in one or more papillæ. Orth,** only, has expressed the belief that the process may be secondary in the papillæ by reason of extension from the adjoining calyx wall. Wegelin and Wildbolz support this contention in that their conclusions favor primary lodgment of tuberculosis in the lateral aspect of the papillæ in most cases, and sometimes in calyx recesses.

Quite a different opinion is held by those who believe that the infection of the kidney may even take place by way of the lymphatics, the retroperitoneal lymph-nodes being regarded as the source.

Our own observations based upon the study of two kidneys in which the tuberculous process had produced alterations of but slight extent, were illuminating in so far as they changed our own pre-conceived notion that in most cases the papillæ are the first portions

**Zeitschr. fuer urolog. Chir.*, Vol. II, p. 201, 1914.

***Pathol. anat. Diagnostik*, 1900.

of the organ to be attacked. The following description of our specimens will explain why the old theories may need revision.

CASE I.—The kidney, specimen from M. S., April 15th, 1908, is about normal in size, the capsule strips off easily and presents no evidence of renal tuberculosis on the surface. Nor does the cut surface, when the organ is bisected by vertical section, show any sign of tuberculous tissue in the renal parenchyma. Near one of the papillæ of the upper pole, and involving one of the recesses of the calyx, as well as the mucous membrane of the calyx over an area about 1 cm. in length, and 6 mm. in width, there is considerable thickening of the mucous membrane of the calyx together with several nodular

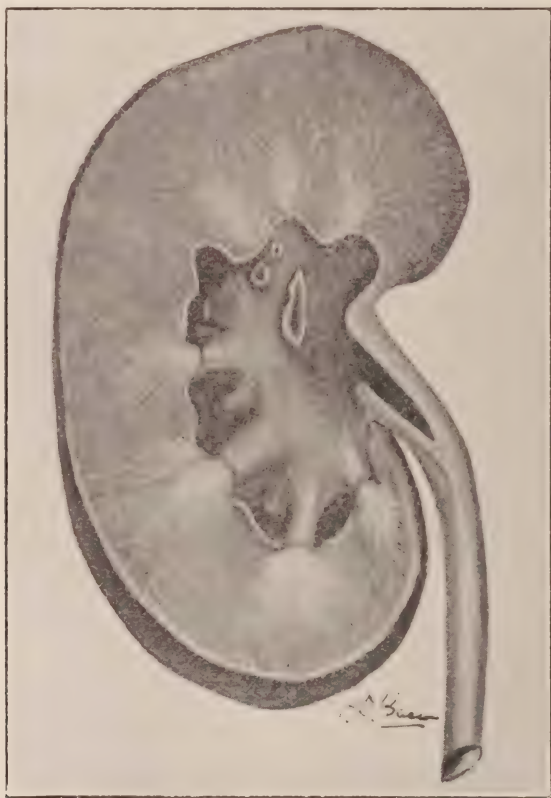


Fig. 1.—Kidney in Case I. Ulcer in pelvis clearly shown; no lesions in parenchyma.

protusions (Fig. 1). About 1 cm. away from the aforementioned papilla, there is an irregularly oval ulcer measuring 8 mm. by 5 mm. of very shallow depth, with a margin of irregular contour and slightly hemorrhagic base. Elsewhere, the pelvis seems to be practically normal, except at one point nearer the ureteral junction, where a thickening of the ureter similar to that above described, seems to include also the peripelvic fat. In this region the pelvis and peripelvic fat show considerable induration, although the mucous membrane of the pelvis is perfectly intact. *Nowhere else in the kidney can any evidence of tuberculous disease be detected.*

Histological examination of the pelvic tissue reveals two lesions—an advanced tuberculous infiltration with cheesy degeneration and ulceration, and

earlier stages, in which there are solitary and agminated tubercles. In the specimens from the thickened and ulcerated portion of the pelvis, near the ureteropelvic junction, there is a combination of miliary tubercles and coagulation necrosis. The oval ulcer illustrated in the figure was not examined, but doubtless the same lesion is here present. In the renal parenchyma there are absolutely no evidences of a tuberculous process anywhere, nor are any of the papillæ affected.

In short, we are dealing here with *early lesions of tuberculosis in the pelvis of a kidney in which there are no signs of involvement of the parenchyma*, and the dissemination of the process has taken place by way of the pelvic mucosa rather than upward into the cortex or pyramids.

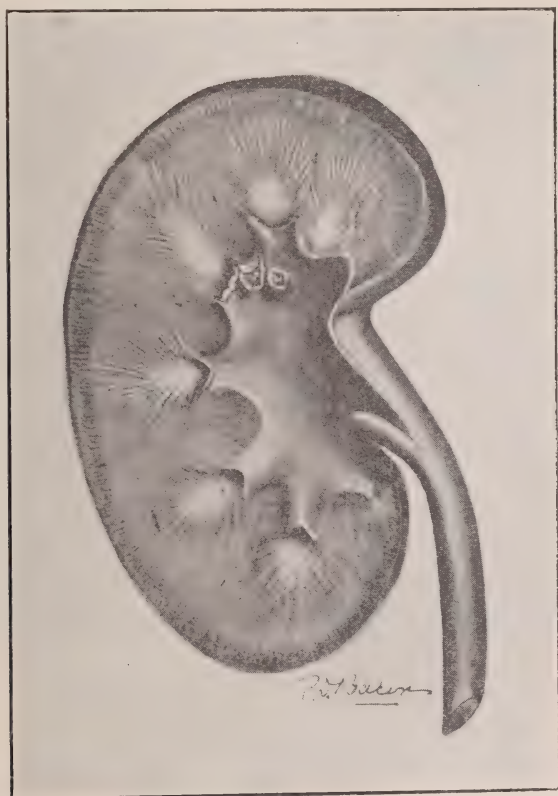


Fig. 2.—Kidney in Case II. Ulceration of tip of one papilla; advanced cheesy lesion of adjoining calyx recess and another in pelvis.

CASE II.—The kidney (specimen from L. S., May 9th, 1914) is of normal size, and externally no sign of a tuberculous process can be seen. A casual examination of the bisected specimen would fail to reveal the presence of any tuberculous lesion, so slight are the changes in this kidney. In one of the papillæ of the upper pole, however, and in the neighboring portion of the calyx and pelvis, there are distinct tuberculous lesions. These are present in the form of alterations in the tip of papilla, and of involvement of the wall of the corresponding calyx. On the whole, it may be said that the changes in the papilla are not as advanced nor as old as those in the adjoining calyx. Careful inspection shows that the tip of the papilla is absent, the normal, pointed, smooth surface being replaced by an irregularly flattened and soft

area (Fig. 2). Partly occupying one of the adjoining recesses and apparently involving the wall of the calyx, there are two lenticular areas of thickening, an extent of about 1 cm. by 5 mm. being changed by this process. Here the calyx is very much thickened, coagulation necrosis has taken place, the wall of the calyx being converted into a firm indurated mass (Fig. 3).

Elsewhere in the pelvis the changes are very minute, only a few scattered miliary tubercles being discernible.

Microscopic Examination.—The solitary affected papilla shows the usual advanced lesion of tuberculosis, extensive coagulation necrosis of the tip of the papilla, and farther inward towards the cortex some discrete and some coalescing miliary tubercles. The most extensive lesion, however, is that which in-

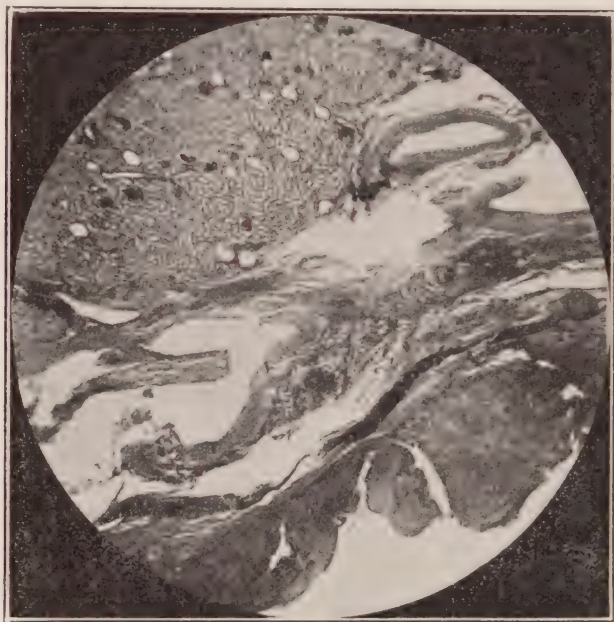


Fig. 3.—Photomicrograph. Above, renal papilla; below, cheesy tuberculosis of calyx wall.

volves the wall of the calyx, where the areas of yellow necrosis, so easily seen on macroscopic examination, present histologically the usual late changes of tuberculosis. In Fig. 3 the calyx wall is seen to be very much thickened, and replaced by a very dense mass of coagulation necrosis. In the periphery of this tissue some recent tubercles can be made out.

In this case it seems undeniable that the necrotic lesions in the calyx and pelvis are at least as advanced, if not older, than that of the tip of the papilla.

CONCLUSIONS.

From a study of 50 tuberculous kidneys, in two of which very early lesions were encountered, there accrued anatomical evidence in favor of the view that the recesses between calyx and papilla or the renal pelvis may be primarily attacked in chronic renal tuberculosis.

Our own observations, although few in number, would strongly favor the assumption that in chronic renal tuberculosis the bacilli gain access to the tissues by a process of filtration from the blood into the urinary tubules. From these they reach the surface of the papillæ or calyx recess, where they are amassed in sufficient numbers to bring about a tuberculous lesion. It seems more than likely that the angle between papilla and calyx may afford a favorable nidus for the accumulation of bacteria, the anatomical disposition of the parts making for stagnation and poor drainage.

CONDITION OF NUTRITION IN NEPHRECTOMIZED PATIENTS.

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AND

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The kidneys play such an important rôle in the metabolism of the body that one would expect violent derangements in the anabolism and catabolism of the animal organism in the event of extirpation of portions of the kidney substance. However, such is not the case. Many patients are known to be living quite comfortably with one kidney. In animals, removal of more than three-quarters of the total renal tissue need not prove necessarily fatal.

A few years ago there appeared in the literature two papers on this subject from the pens of Israel,¹ and of Boeckel,² in which statistical studies were reported of the immediate and remote results in 1,023 and 57 cases of nephrectomy respectively. Israel presented his conclusions based upon the study of 1,023 cases of nephrectomy for renal tuberculosis, 170 of these being cases of his own; the information concerning the others was obtained through personal communication with some twenty of the best-known European urologic surgeons. His most important conclusions drawn from this large material may be summarized as follows. There is no spontaneous cure of renal tuberculosis; the only thing that cures the disease is early nephrectomy. The total mortality, *i. e.*, both 'early' (within six months of operation) and 'late,' amounts to 25 per cent. of all cases operated on, so that three-fourths of the patients are saved by the operation. Nephrectomy in cases of unilateral tuberculosis prevents its development in the opposite kidney in most cases, but the healthy kidney will become infected from a tuberculous one which is not removed much more frequently than from any other focus. In bilateral kidney tuberculosis, nephrectomy should be done only where there is severe destruction of one organ with only an incident affection in the other, associated with frequent, severe hemorrhages, or intolerable pain. In cases of unilateral tuberculosis associated with Bright's disease, nephrectomy should be done only if the danger from the tuberculous kidney seems to be greater than that from the lack of secreting parenchyma. Toxic conditions of the opposite kidney, other than Bright's, gen-

erally clear up after a nephrectomy. In unilateral tuberculosis the bacilli disappear from the urine in three-fourths of all cases, this being determined by inoculation. They may persist, however, without producing symptoms, or as long as seventeen years, these patients being comparable to typhoid carriers. The bacilli disappear more frequently than does the inflammation of the bladder mucosa, which is completely cured in but 43.5 per cent. of the cases. Tuberculosis of the ureter is cured spontaneously after nephrectomy in the majority of cases; ureteral fistula develops in 11.5 per cent., but nearly always closes within four years. A subsequent pregnancy has no more effect on the remaining healthy kidney than on the kidneys of normal individuals.

Boeckel reported an interesting and detailed study of 57 nephrectomies performed by Andre, which were followed carefully for varying periods up to nine years. There were 31 males and 26 females; the youngest was aged thirteen, the oldest, fifty-four; the right side was involved twenty-eight and the left twenty-nine times. In 5 cases the nephrectomy was secondary, one ten years after an operation for renal calculus, and in the four others after nephrotomy for pyonephrosis, the interval between the nephrotomy and nephrectomy being from a month to seven weeks. In 15 cases the nephrectomy was a subcapsular one, because of intense perinephritis, the perinephritic fat being extirpated as freely as possible. The immediate operative results were 55 cures and 2 deaths, one being independent of the operation, and the other due to a general tuberculous infection six weeks after the operation. After a transient oliguria, following the operation, the quantity of urine returns to the normal in most cases, and in a few there is polyuria. There were 9 secondary deaths. Of the remaining 46 cases, 5 were only transiently ameliorated. The other 41 were much improved or were completely cured. All have been examined recently or have been heard from. They are all in a much improved general condition, and all have gained weight. Many have returned to their work, sustain fatigue, and one has gone through a period of military service.

In 1851, Valentin³ observed that upon performing a unilateral nephrectomy on rabbits, death did not necessarily ensue. On the contrary, the other kidney became enlarged and took upon itself the function of its missing partner, so much so, that not only was there no diminution in the urinary output, but the opposite was the case—the urine excretion was increased. Twenty years later, Rosenstein⁴ confirmed Valentin's findings. He, also, observed that the remaining kidney hypertrophies and compensates for the loss of the other one.

Paoli⁵ performed experiments on dogs, cats and rabbits, and he concluded that one-half of one kidney must be left as a minimum, in order that the nutrition of the animal should be life supporting.

According to him the removal of more kidney tissue is invariably fatal.

We are indebted to Fleisher and Penzoldt,⁶ Tuffier,⁷ Bradford,⁸ Bainbridge and Beddard,⁹ and Pearce,¹⁰ for further investigations in this field.

Fleisher and Penzoldt found in their experiments on nephrectomized dogs that there was no urea retention, the remaining kidney working quite adequately and compensatingly. Tuffier made very extensive investigations in this field. He removed one kidney from dogs, and then after an interval he extirpated portions of the remaining kidney in order to observe what was the minimum amount of renal tissue requisite to maintain life. This minimum he placed at 1.5 gm. of kidney per kilo of body weight.

It was Brown-Sequard¹¹ who pointed out that in animals which had total nephrectomy performed on them, death resulted primarily from a lack of the internal secretion that the renal tissue normally liberated into the blood-stream. This was indirectly confirmed by Bradford, who found that after the removal of three-fourths of the total kidney tissue, death resulted after a period varying from one to six weeks, from asthenia and not from uremia. No coma or convulsions were noticed in the moribund animals.

Bradford found that excision of a portion of one kidney or of portions of both kidneys is followed by an increase in the volume of urine, but not by an increase in the quantity of total solids. Curiously enough, he found that after excision of three-quarters of both kidneys, there was an absolute increase in the total urea output, if the appetite of the animal continued good; otherwise the urea increase was relative. He also found that the blood and tissues contained larger quantities of nitrogenous extractives.

In their experiments which they performed on cats, Bainbridge and Beddard observed that upon extirpation of three-fourths of the renal substance, loss of appetite and wasting were induced and a condition is set up which is similar to starvation. Death results in a few days or a few weeks. The increase of nitrogen in the urine was not constant, and there was no increase in the volume of the urine.

Pearce concluded from his experiments on dogs that the removal of one-half, two-thirds, and sometimes three-quarters of the kidney tissue does not cause any change in the general nitrogenous metabolism as determined by estimation of nitrogen, urea and ammonia. Removal of larger amounts of renal substance induces a condition similar to starvation.

We studied the urinary output in two patients upon whom unilateral nephrectomy had been performed. The patients were both married women, thirty-five and thirty-six years of age respectively. Their clinical history will be found toward the end of this paper.

TABLE I. (Mrs. K.)

Day	Quantity c.cm.	Total nitro- gen grm.	Urea N. Per cent.	Ammonia N. Per cent.	Purin N. Per cent.	Creatinin Nitrogen Per cent.	Indican	Total S. grm.	Inorgan. SO ₄ Per cent.	Ether. SO ₄ Per cent.	Neutr. SO ₄ Per cent.	NaCl grm.	CaO grm.	P ₂ O ₅ grm.	Albumin	Specific gravity
1	1715	16.903	90.2	2.78	3.42	2.75	trace	2.84	33.2	11.4	55.4	32.29	1.45	3.75	trace	1.025
2	1230	13.259	88.5	2.92	3.55	2.50	trace	1.75	29.7	16.7	53.6	25.83	1.07	2.82	trace	1.025
3	1480	18.979	87.8	2.79	3.25	2.42	trace	2.15	30.8	14.5	54.7	27.60	1.25	2.94	trace	1.025
Av'r'ge	1475	16.3803	88.86	2.79	3.406	2.82	trace	2.27	31.2	14.2	54.9	28.57	1.25	3.17	trace	1.025

TABLE II. (Mrs. B.)

	Quantity c.cm.	Total nitro- gen grm.	Urea N. Per cent.	Ammonia N. Per cent.	Purin N. Per cent.	Creatinin Nitrogen Per cent.	Indican	Total S. grm.	Inorgan. SO ₄ Per cent.	Ether. SO ₄ Per cent.	Neutr. SO ₄ Per cent.	NaCl grm.	CaO grm.	P ₂ O ₅ grm.	Albumin	Specific gravity
1	650	7.898	85.7	3.52	4.41	2.80	trace	1.33	64.3	15.7	20.0	7.8	1.82	2.02	none	1.021
2	770	6.640	83.8	2.24	4.72	2.51	trace	1.25	52.8	17.4	19.8	10.2	1.45	2.14	none	1.019
3	840	8.250	84.2	3.80	4.22	2.71	trace	1.87	56.6	16.7	16.7	11.4	1.74	2.07	none	1.020
Av'r'ge	753	7.589	84.5	3.18	4.45	2.67	trace	1.48	57.9	16.6	18.8	9.8	1.67	2.07	none	1.020

These investigations were carried out on the patients long after the removal of their kidneys. The patients were fed on a diet similar to the one recommended by Folin.¹² The urines were collected daily for a period of three consecutive days. Determinations of the following fractions were made daily: Total nitrogen, urea, ammonia, purin bases, including uric acid, creatinin, total sulphur, inorganic sulphates, ethereal sulphates, neutral sulphur, sodium chloride, phosphorus pentoxide, calcium oxide, indican and albumin.

The accompanying tables will show at a glance the output of these various substances in the urine (Tables I and II).

The methods used in the urine analyses were the following: The nitrogen was estimated by the Kjeldahl method. The urea by the Benedict method; the ammonia by the Folin method¹³; the total sulphur by the Benedict method¹⁴; total and ethereal sulphates by the Folin method¹⁵; total phosphorus by the Neumann method¹⁶; creatinin by the Folin method¹⁷; purin bases by the Krueger-Schmidt method¹⁸; sodium chloride by Clark's modification of Dehn's method¹⁹; calcium by the McCrudden method.²⁰

From an examination of the analytical data, we must conclude that the excretion of the various catabolic fractions in the urine is quite normal. In the case of the second patient, while the output of the different fractions is small, this must not be taken as evidence of disturbed metabolism. The patient feels quite well, and the small output must be ascribed to a small intake. It will be seen from these facts that the remaining kidney compensates adequately when the opposite kidney is removed.

CASE I.—Mrs. K., married, *æt.* thirty-five. Present illness began about two years ago. Diagnosis was made of calculus in the right renal pelvis. Right pyelotomy was performed and a large calculus was removed. After some time the patient began to complain of pain on the *left* side. This was found to be due to another calculus in the upper pole of the left kidney. It was decided to do a left nephrectomy. The present condition of the patient is quite satisfactory. No symptoms of edema or uremia present.

CASE II.—Mrs. B., married, *æt.* thirty-six. Present illness began eight years ago. Diagnosis of tuberculosis of the right kidney was made, and the kidney was removed. Present condition: Patient suffers from headache and dizziness. Blood-pressure: Systolic, 110 mm. Hg., diastolic, 75 mm. Hg. Phenolsulphonephthalein test, two hours, ten minutes, total of 55 per cent.

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MEDICAL AND SURGICAL PROGRESS.

RENAL HEMATURIA.

A REVIEW OF RECENT LITERATURE.

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Brothers' Hospital.

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There is no other single symptom of urogenital disease, the importance and significance of which is so frequently overlooked and the value of which so often underestimated as is the presence of blood in the urine. If, instead of attributing the presence of blood in the urine to a cold or exposure, to fatigue, strain, gout, etc., we would educate ourselves to the fact that hematuria means the existence of some pathological change somewhere in the urogenital tract, we could be rendering our patients better service by starting them on the road to correct treatment early in the course of their disease.

The two thoughts which should be uppermost in our minds in every given case of hematuria are (1) where does the lesion, which produces the hematuria, exist, and (2) what is the nature of the underlying pathological process which is provocative of the bleeding.

At times one can make a tentative clinical diagnosis in cases of renal hematuria, associated with the passage of blood clots down the ureter, which clots, in their passage, evoke an attack of renal colic. In the large majority, however, a tentative diagnosis cannot be made, because, in so many of these cases the hematuria is painless, and because of the absence of other urinary symptoms.

It becomes necessary, therefore, to differentiate between painless and symptomless hematuria. The hematuria associated with tumor is often painless; while the term symptomless is usually applied to the group of cases in which no cause for the hematuria can be found, clinically. On the other hand, there may be present a history of urinary disturbance suggestive of bladder disease, only to note after a careful cystoscopic examination that the hematuria is renal in origin.

Even after a careful cystoscopic examination has been made, one cannot always answer the above-mentioned questions. For example, if the hematuria is vesical in origin, it is quite simple to cystoscope such a patient at any time and determine definitely the vesical origin of the hematuria. If, however, the hematuria is renal in origin, and the patient is not bleeding at the time of cystoscopy, no positive information is obtained. The negative evidence, as far as the bladder is concerned, simply excludes this organ.

During the past five years much clinical study has been given to the cases of profuse kidney hemorrhage. This work has been directed principally toward determining the etiological factor in each case, the pathological changes found, both macroscopic and microscopic, as well as consideration of the treatment of these cases. The microscopic examination of pieces removed at operation, as well as histological study of the entire kidney in cases in which nephrectomy was carried out, has resulted in determining the cause of the bleeding in a large number of cases that heretofore would have been classified as essential, idiopathic, neurotic, etc.

Stone, tumor and tuberculosis were the usual causes of renal

hematuria given in the textbooks and taught to the students. The results of recent study have shown that other causative factors may produce renal hematuria, which must be differentiated from the usual stereotyped factors previously mentioned.

Randall, in an exhaustive study on the etiology of unilateral renal hematuria, lays stress on congestion as a factor. He reviews the nephritic theory, hemophilia and angioneurosis. No one of these theories, in his opinion, explains the pathological condition of the kidney which allows the passage of blood, unilaterally, into the urine, and which represents the only symptom of which the patient must be relieved. He believes that we have to deal with a condition of local congestion or venous stasis.

Of interest in this connection is the case reported by Rogue and Chalier. Their patient was suffering from chronic nephritis associated with a profuse hematuria. There was present also an enlargement of the liver and a disturbance in its function. The hematuria did not disappear until the liver began to get smaller. From this they assume that some of the hematurias of chronic nephritis are due to enlargements of the liver.

Even after cystoscopy and ureteral catheterization have been carried out, and the fact determined that the hematuria is unilateral, one should not forget the possibility of the existence of a bilateral lesion, and that only one side may be actively bleeding at the time of the cystoscopic examination. Not only at the time of diagnosis but also at the time of treatment should this phase of the subject have thorough consideration, so that the patient be spared the ordeal of losing one of two diseased kidneys, leaving him one which being below par cannot long carry on the work of both.

This point is well borne out by the case reports of Kretschmer, Vincent and Truesdale. Vincent's patient had been having bloody urine for two or three months. The origin of the bloody urine was from the right kidney and the left kidney secreted an apparently normal urine. A decapsulation was followed by a prompt cessation of the bleeding. The patient remained free from his trouble for nearly four years when he had a recurrence of the hematuria. Cystoscopy at this time showed that the blood was coming from both kidneys. Microscopic examination of excised portions of each kidney revealed the presence of a bilateral nephritis.

That nephritic changes in the kidney are a much more frequent cause of hematuria than was formerly taught is evidenced by the large number of carefully studied cases that were reported last year.

In a recent article bearing directly on the question of essential hematuria, Kretschmer reviews the literature on this subject. He was able to collect 82 cases not included in a previous report. Histological reports were found in 27 cases, in 22 of which changes of a nephritic nature were found.

In the case reported by him, the patient had no clinical symptoms of nephritis; that is, no albumin or casts, no edemas, no high blood-pressure, no retinal changes, and yet the pathological report showed nephritic changes in the kidney.

The patient had had two attacks of hematuria five years apart. The first attack was from the right kidney. Decapsulation was followed by cessation of bleeding ten months later. The second at-

tack occurred five years after the first and was from the left kidney. Decapsulation was followed by prompt cessation of the bleeding. The interesting features of this case were:—

1. The long-continued duration of each attack of hematuria.
2. The relatively long time between the two attacks.
3. Prompt cessation of the bleeding following decapsulation (second operation).
4. The evident gross and microscopic changes in the kidney.
5. Absence of albumin and casts in the urine in the presence of marked nephritic changes in the kidney.

The author comes to the following conclusions:—

1. Unilateral renal hematuria does not always mean unilateral disease, as one may be dealing with a bilateral lesion, although only one side may be bleeding at the time of the examination.
2. Absence of albumin and casts in the urine does not exclude the presence of nephritic changes in the kidney.
3. Cystoscopy and ureteral catheterization must be employed in each case to determine definitely the renal origin of the blood.
4. Histological examination of several pieces of excised tissue or preferably of the entire kidney must be made in every case before a diagnosis of essential hematuria can be made.
5. Cultures of catheterized specimens of urine from each kidney to determine a possible bacterial cause for the hemorrhage must be made in all obscure cases.

That hematuria occurs more frequently in nephritis than we usually believe is the opinion of Elsner, who in careful examinations of 4,832 patients found 229 cases of chronic nephritis, 14 cases of acute tubal nephritis, 77 cases of chronic interstitial nephritis, 8 cases of secondary congested kidney, and 7 cases of tuberculous nephritis. Of the 229 cases of tubal nephritis, blood was found in the urine in 33 per cent. The 14 cases of acute nephritis were no exception to the rule, for in all the urine contained blood. Of the 77 cases of interstitial nephritis, 14 per cent. were found with blood in the urine. The urine of the 8 cases of secondary congested kidney all contained blood.

Regarding the occurrence of hematuria, Elsner states that it may be a continuous symptom or may recur at irregular periods. In some of the cases the intervals have been so long that the patient and physician have been led to believe that the suspected serious or organic disturbance had been overcome; indeed, the incident had almost faded from memory.

That great care must be exercised in using the term 'essential hematuria' is becoming more apparent each year. As cases are more closely studied, the term is being used less frequently. Clinical cases, when first seen, very often are classified as 'essential hematuria.' Subsequent studies, clinical, pathological and bacteriological, often prove this to be an error, as a cause for the bleeding is found.

The ease with which such an occurrence is possible is aptly illustrated by the case of Schuepbach. His case demonstrates very emphatically that because we cannot find the cause of the bleeding we are not justified in assuming that no cause exists and hence it must be a case of essential hematuria.

Schuepbach's patient had hematuria for three weeks without apparent cause and was without symptoms. Cystoscopy demonstrated blood coming from the left ureter. Nephrotomy was done.

The capsule was firmly adherent but otherwise the kidney appeared normal. Two pieces were excised for histological examination. Because of the occurrence of a terrific secondary hemorrhage and collapse, nephrectomy was carried out. Histological report of the excised pieces showed a slight increase in the interstitial tissue and a few hyaline glomeruli. Histological report of the nephrectomized kidney showed infarcts and leucocytic infiltration. Because of the negative findings in the two excised pieces and because of negative findings in the removed kidney, a diagnosis of essential hematuria was made.

A careful examination of the kidney in serial section revealed the presence of typical tuberculosis, which changes were limited to so small an area that they were overlooked.

This case is a very striking example of how easily a small lesion may be overlooked and of the fact that small lesions can produce grave disturbances. Many authors, in reporting cases of this kind, find and report lesions of small extent, and they add that these small lesions cannot produce such profuse hemorrhages (Casper).

It is clear, therefore, that we are not in a position to reckon between the extent of the lesion and the amount of the bleeding. Why go out of our way looking for theoretical explanations for bleeding, when pathological changes are at hand?

Stræter comes to the conclusion that in nephritis, unilateral, profuse and long-continued hematuria occurs with or without attacks of colic.

Wortman is very sceptical on the question of essential hematuria. He has seen many cases in which the hematuria was the only symptom early in the onset; later on other symptoms developed, which helped to clear up the cause of the bleeding.

Payne and MacNider believe that in the clinical condition in which this 'so-called essential hematuria' develops, one of the constant findings at operation is either a patchy or a diffuse fibrosis of the kidney. In addition to the interstitial changes, chronic changes involving the glomerulus are fairly constantly seen, which with certain limitations might be called a glomerulo-nephritis.

In a case in which Cathelin performed a nephrectomy because of continued unilateral bleeding, he found sclerosis of the glomeruli and round-cell infiltration around the excretory tubules, from which he assumes he was dealing with an ascending infection.

Cases in which nephritic changes were found associated with hematuria were recently reported by Marion, Pool, Baum and others.

Fenwick several years ago called attention to a previously not recognized factor in the production of profuse renal hematuria—namely, the presence of vascular changes of the renal papillæ. This condition has been described under the name of angioma of the renal papillæ, and as renal varix.

Newman has recently reported 3 such cases and the one reported by Baum is probably one of the first recorded in Germany.

One of the rare and unusual causes of hematuria is the bleeding associated with hydronephrosis, such as the case reported by Marchais, who rightly states that this complication is not common and usually is the result of a trauma, a fact which does not exclude the occurrence of a urohemato-nephrosis of a malignant source. The

symptomatology in this group of cases is not clear, and other than those instances in which a renal tumor decreases in volume after the hematuria has taken place, it is hardly possible to recognize the nature of the contents. The diagnosis is often difficult and frequently is made only when the sac is incised, while the prognosis is serious and demands immediate operation, which should be a nephrectomy if the functional condition of the opposite kidney is known.

One group of cases which has not received as much study as have many hematuria cases are the renal hematurias of pregnancy. Dor and Moirand believe that toxic influences play a rôle in the production of the hematuria.

Two cases of hematuria due to the ingestion of urotropin have been reported by Cuntz. In one case the hematuria persisted for three weeks after the withdrawal of the urotropin. In the other case hematuria was associated with bladder irritability.

Belkowsky has seen hematuria follow the administration of urotropin in 4 cases, and he reports in detail one case which occurred in a fatal case of typhoid. According to him, the hematuria is more apt to occur in cases with very high temperature, as this favors the decomposition of the urotropin into formaldehyde and ammonia. The 4 cases occurred among 40 typhoid patients who were given 0.5 to 0.6 gm. three to four times a day. The hematuria did not seem in any case to influence the typhoid unfavorably, and it stopped when the urotropin was discontinued.

In an article containing a review of the literature of hematuria and hemophilia, Mankiewicz reports 2 cases of so-called renal hemophilia. In his first case no cystoscopic report is found, so that the origin of the bleeding was not determined. In his second case, the patient had joint involvement of the knee and elbow. The knee, he stated, was typical of arthritis deformans.

From recent works on the subject of arthritis deformans, we know that all or practically all cases are of infectious origin, due to the existence of a focus elsewhere in the body, and because of this fact we must seriously consider an infectious origin for the hematuria in Mankiewicz's second case.

Gaspari believes that many of the cases of so-called renal hemophilia can be explained on a basis of movable kidney. He reports one case of profuse renal hemorrhage in which he was able to rule out tuberculosis and neoplasm. At the time of examination, an enlarged and tender, movable kidney was found. He offers the following explanation for the hemorrhage in this group of cases: Renal mobility, traction on and partial occlusion of the vessels, renal stasis, diapedesis, hemorrhage.

A new and perhaps hitherto unrecognized or possibly overlooked factor in the production of hematuria has been reported by Roux. His report is one worth bearing in mind, and should caution, not only physicians, but internes, nurses and others who may have occasion to use benzine in cleansing wounds, removing adhesive plaster, etc., to avoid using large quantities freely. Roux reports 6 cases, and although he could not find a record of similar cases reported, believes that the hematuria was the direct result of the promiscuous use of benzine. Five to ten days after operation, the patients developed a red or a light brownish-red color of the urine, which disappeared again in a few days. Roux was impressed by the

fact that this was noted only in those cases in which benzine had been freely used. Microscopic examinations showed the presence of blood cells. Since the more careful use of benzine, no more of these cases of hematuria have been seen in his clinic.

The change in our conception of renal hematuria and the establishing of a pathological basis for the hemorrhage, as well as a more detailed clinical study of these cases, has resulted, in part at least, in the opening up of new avenues of treatment. So that to-day these cases are subjected to non-operative treatment first, and not until after repeated failure of one or all of the non-operative measures should one resort to surgical treatment. This, of course, does not apply to cases of stone, tumor, or tuberculosis.

No one therapeutic measure seems to be a specific over the others, as in many cases the hematuria has permanently stopped after resorting to different therapeutic agents. This is in part due to the different etiological factors present in the individual case.

Thus Braasch, in one of 4 cases in which he used vaccines, reports the cessation of the hematuria, a procedure also reported by Billings. Braasch further reports 26 cases of renal hematuria, in which the bleeding stopped after simple ureteral catheterization. This remained permanent in 4 cases. In 18 cases, the pelvis was over-distended with methylene-blue, or colloidal silver salts, with permanent cessation of the hematuria in 3 cases. In 6 cases, adrenalin, 1:2000, was injected into the renal pelvis. A recurrence of the hematuria took place in all but one case.

The successful use of adrenalin was also reported by Moore, as well as by the writer. In Moore's case, the hematuria had been present for twenty years and subsided after three injections of adrenalin into the renal pelvis. In Kretschmer's case, the hematuria had been present off and on since the first pregnancy. The patient was in poor health and refused operation. In all she received three injections, with the result that the hematuria promptly stopped.

The simplicity of the treatment of renal hematuria with intrapelvic injections of adrenalin is apparent and the author gives the following advantages:—

1. If by this simple procedure we are able to control the renal bleeding, the condition of the patient's urine may be studied at a time when it is free from large quantities of blood.

2. In cases in which there is a severe degree of secondary anemia, due to the loss of large quantities of blood, the patient may be put on a general tonic treatment besides the adrenalin treatment, until such improvement is reached as will render operation a safe procedure.

3. It may be the means of avoiding nephrectomy.

As an aid to the coagulation of the blood, Ungar recommended the use of 10 per cent. solutions of sugar.

In diseases of the kidney with parenchymatous bleeding, subcutaneous injections of gelatine do not stop the bleeding. On the contrary, they seem to increase it. Therefore, according to Studzuiski, subcutaneous gelatine injections are contraindicated in these cases.

Much interest has been aroused by recent publications dealing with the treatment of kidney hemorrhage with serum. In many of these reports the results are nothing short of spectacular. The time elapsed since the original treatments given has been too short and the number of cases treated has been too small to come to any

definite conclusion as to whether or not the serum treatment will obtain a permanent place in the treatment of renal hemorrhage. Nevertheless, as a temporary measure, it may be of value toward controlling the hemorrhage, so that the patient's general health can be built up and a study of the urine carried out in order to determine the cause of the bleeding.

Various sera and different methods of usage have been advocated. Barringer advises the use of serum both by subcutaneous injections and by the direct application of the serum to the bleeding point in the kidney pelvis. He used human serum in his case, but advises either human serum or diphtheria antitoxin.

An equally striking result was obtained by Allen in his case in which surgical treatment was out of the question. He injected 20 c.cm. of whole blood, obtained from the patient's sister, into the cellular tissue of her breast. Within twenty hours the patient was passing clear urine and it has remained clear ever since.

Clowes and Busch used 'precipitated blood-sera' in treating various forms of hemorrhage, including hemorrhages from the renal pelvis. For upwards of a year they have employed preparations derived from horse serum and have obtained clinical results fully equal to those previously obtained with precipitated rabbit and human sera.

THE TREATMENT OF ACUTE GONORRHEAL EPIDIDYMITIS.

A REVIEW OF RECENT LITERATURE.

By JOHN R. CAULK, M. D., of the Editorial Staff.

1. Ashcraft: The Surgical Treatment of Epididymitis. (*Amer. Practitioner*, Vol. 47, pp. 53-58, 1913.)
2. Clark: Surgical Treatment of Acute Gonorrheal Epididymitis by Epididymotomy. (*Annals of Surg.*, Vol. 59, No. 5, p. 739, May, 1914.)
3. Culler: Epididymotomy: A Plea for a Rational Treatment of Epididymitis. (*Amer. Journ. of Urology*, Vol. 9, pp. 193-196, 1913; *Journ. Amer. Med. Assoc.*, Vol. 60, p. 415, 1913.)
4. Cunningham: The Operative Treatment of Acute Gonorrheal Epididymitis. (*Surg., Gynec. and Obstet.*, Vol. 17, p. 749, 1913.)
5. Eckels: Epididymotomy: The Radical Operative Treatment of Epididymitis. (*Amer. Journ. Urol.*, Vol. 10, p. 69, 1914.)
6. Eckels: Epididymotomy: The Radical Operative Treatment of Epididymitis. (*Journ. Amer. Med. Assoc.*, Vol. 61, p. 470, 1913.)
7. Hamonic: The Treatment of Orchi-Epididymitis by the Writer's Method. (*Rev. clin. d'androl. et de gynec.*, Vol. 18, p. 89, 1912.)
8. Knight: Epididymotomy, with Report of Cases. (*Journ. Amer. Med. Assoc.*, Vol. 62, p. 351, 1914.)
9. Morton: Hagner Operation for Gonorrheal Epididymitis. (*Med. Times*, Vol. 41, p. 325, 1913.)
10. Pucci: Surgical Cure of Acute Gonorrheal Epididymitis. (*Gior. d. med. mil.*, Vol. 60, p. 656, 1912.)
11. Saynisch: Treatment of Epididymitis with Arthigon in Combination with Ichthyol. (*Deutsch. med. Wochenschr.*, Vol. 39, p. 1942, 1913.)
12. Schmutz: A Comparative Study of the New Treatments of Acute Gonorrheal Epididymitis and in Particular the Treatment by Antimeningococcic Serum. (*Journ. d'urol. méd. et chir.*, Vol. IV, pp. 241-254, 1913.)
13. Heitz-Boyer (*La Presse Med.*, 1913).

A disease so frequent as acute gonorrheal epididymitis, occurring in 16 to 20 per cent. of gonorrheal infections, and one that bears such an important social and economic aspect, attended with such intense suffering on the part of the afflicted individual, should naturally be regarded with extreme seriousness and offered treatment which is commensurate with the best possible immediate and remote results.

The treatment is classified as simple medical, specific medical, and surgical. The treatment of epididymitis by means of simple local remedies has been the method usually employed. The idea has been rest, elevation, either hot or cold applications, urinary flushings, sedatives, general and local. Bier's method of hyperemia has been applied as well as radioactive substances.

The exact description of the simple medical treatments will not be detailed, as they are familiar to all. A brief outline of the procedure and the results of the hyperemic method, which has been so successfully employed by Koenig, will be given. The scrotum is elevated, a layer of cotton is placed around the neck of the scrotum and a rubber tube is put in place. This is left in place from twenty to thirty hours; after this it is removed and the testicle is then elevated in order to hasten the absorption of the edema, which is generally marked. This procedure is repeated frequently. Koenig states that the subjective symptoms of the patient offer a better signal for the relaxation of pressure than the color of the scrotum or the edema. According to him the pain of acute epididymitis rapidly disappears with this therapy. The induration and edema, however, persist, but can be controlled by compresses and other measures to induce active hyperemia.

Emodi studied the functional results of cases treated in this manner, and claims only 33 per cent. of the cases became sterile by azoospermia as against 70 per cent. treated by the usual palliative method. These are very striking figures and extremely difficult for all to accept. Authors in general are not so enthusiastic about this method of treatment.

In 1912 Beurmann applied radioactive substances in the treatment of epididymo-orchitis. He used a non-silicious uranium which is rich in penetrating rays, and whose activity is constant and moderate. He used this method in 21 cases and concluded that the pain rapidly disappeared within twenty-four hours. Pain on pressure lasted much longer, as did the nodule in the tail of the epididymis. He claims that the sterilizing action of the rays upon the testicle which has been claimed by some, is doubtful, and is not a contraindication to the method, as he believes sterility from the blocking of the canal is almost inevitable anyway. This latter assertion is greatly doubted.

Gonococcal vaccines, antigenococcic serum, and antimeningococcic serum are the specific treatments. Gonococcal vaccines have been used quite extensively in this country and abroad, and here and there authors have claimed excellent results in acute epididymitis, stating that the pain was lessened and convalescence distinctly abbreviated. Saynisch in his article reports enthusiastically the results of arthigen, which he gives intravenously in combination with ichthyol locally. He believes that by such a combination the cure is much more rapid and effective. The majority of observers, however, have not been able to observe such material benefits by this method. The antigenococcic serum was first used by John Rogers in 1906. He reports with Torey, 6 cases of acute epididymitis treated with this serum. Bruck, in 1909, reported attractive results. In this country, Swinburne, of New York, has been the greatest advocate. A general review will show that the results with antigenococcic serum, as with the vaccine, have not been uniformly satisfactory.

The line of serum therapy which is attracting particular interest to-day, and is being used in many of the American and foreign clinics, is the treatment of acute gonorrheal epididymitis by means of the antimeningococcic serum. Since Pissavy and Chauvet demonstrated experimentally the marked beneficial effects of the antimeningococcic serum, many others, notably Ramond and Chiray, Strominger and Heresco have used it in the various complications of the disease with great success. It remained for Heitz-Boyer in 1912 to apply the treatment to acute epididymitis. He used the serum prepared by the Pasteur Institute. An injection of 20 c.cm. was made deeply into the muscles of the buttocks and was repeated at intervals of five to six days. His results were so encouraging that many others immediately adopted the treatment; and Schmutz, in 1913, reports 52 cases, 17 of which had received but a single dose; 18, two doses; 12, three, and 2 each four and five.

As can be seen a great majority received only two doses. The results claimed by the authors are briefly the following. Immediate result: the pain is almost immediately influenced by the serum. Many authors regard this as remarkable; at times within two to three hours there is considerable amelioration, and patients who have been unable to sleep on account of pain enjoy a refreshing rest. The pain to pressure is also less marked, and generally on the next day the patient can tolerate a fair amount of palpation. To Schmutz it seems that this analgesic action is specific, as there was only one case on which it did not effect a rapid abatement, the epididymis being tubercular.

The acute inflammatory swelling and edema rapidly disappear within twenty-four to thirty-six hours and the scrotum loses its acute aspect. The striking effect is to be seen upon the temperature, which in some cases drops several degrees in a few hours. The authors assert that the edema of the cord and the accompanying hydrocele of the tunica vaginalis also rapidly disappear, so that within a few days the cord may feel practically normal. Schmutz claims that by means of this treatment, within fifteen days, in a great majority of cases, the only evidence left is in the globus minor, which presents itself as a nodule, but that this nodule is not painful as is ordinarily the case. The late results have been followed in 6 cases by Schmutz. In 5 of these there was absolutely nothing abnormal to be detected. The sixth case had a small nodule in the tail of the epididymis, which was only slightly sensitive to pressure, and very slightly indurated. He is unable to report the conservation of function, but he believes that on account of the rapid resolution and disappearance of the nodule in the epididymis, strong evidence and promise of preservation of function is offered. The enthusiasts of this line of therapy believe that it is preferable to any other. Its technique is simple.

The treatment of acute gonorrheal epididymitis by surgical measures has been much more popular in the last five or six years. The surgical procedures have been puncture; puncture followed by injection and incision. Puncture of the tail of the epididymis by means of long needles has been done very frequently with marked immediate benefit, but the effects are only transitory, and at the present day the procedure is not advised. Puncture followed by injection of electrogol was used first by Hamonic and Asch in 1907, and Dore in 1911. Following this injection patients usually experi-

ence some pain from distention, but the authors say that this gradually disappears, and following this there is a gradual diminution of symptoms. This treatment also had a rapid beneficial effect upon the temperature, causing a rapid fall. Asch claims that in two or three days in some cases the epididymis presents a normal feel. Usually one injection is sufficient, unless the process is extreme and infiltration is marked. In such cases it is necessary to repeat it. Rohrbach claims that electrogol has more or less of a specific effect on the disease. Schmutz tried the electrogol method on ten patients. His results were not in harmony with those of Asch and Rohrbach. His patients suffered extreme pain, and the effects upon the infiltration were practically negligible.

The surgical procedure which has enjoyed the greatest degree of popularity and effected more substantial cures and encouraging results has been the incision and drainage of the epididymis—epididymotomy. Pigoroff, in 1852, seemed to have been the first to open the inflamed epididymis. In 1864 Smith reported 1,000 cases in which he had punctured the epididymis, and reported satisfactory results. In 1906 Escat, Belfield and Bazet also reported cases in which drainage had been employed in acute epididymitis, but it remained for Hagner, of Washington, in 1906, to put the operation on a firm foundation and publish a systematic technique, and it is through him that the operation has become popularized. At the present day a great majority of American clinics have adopted his operation, the technique of which is as follows.

The junction of the epididymis with the testicle is defined and an incision about 2 in. long is made through the scrotal skin along this line. The tunica vaginalis is opened and such fluid as may be present in its cavity escapes. The swollen epididymis with the testicle is delivered. The epididymis is now punctured in many places in the inflamed areas with a narrow-bladed knife. The punctures must penetrate the infiltrated fibrous covering and the body of the epididymis must be entered by the point of the knife. If pus escapes from the punctures the opening through which it makes its exit is to be enlarged and the cavity from which it comes washed out with a corrosive sublimate solution of 1:1000 strength by means of a syringe.

If the punctures do not yield pus after they have been made through the fibrous covering, they should be probed with a small probe or director. In this way foci can be opened, at times, which may have escaped puncture with the knife. The epididymis should be squeezed and its surface and that of the testicle and tunica vaginalis sponged with a corrosive sublimate solution 1:1000, followed by a sterile saline solution. The testicle is then replaced, and a puncture made at the bottom of the scrotum through which a rubber tissue drain is placed in such a way that it lies along the outer side of the whole length of the epididymis. The skin wound is then closed by passing two silkworm gut stay sutures through the skin, dartos, and tunica vaginalis, and tied over rubber tubes, one on either side of the wound. The tunica vaginalis incision is closed by continuous fine catgut suture and the skin incision by a subcutaneous silkworm gut suture. A sterile dressing and a supporter are applied. The stay sutures are to be removed at the end of the first twenty-four hours, their purpose having been to prevent the dartos from retracting and thus causing ecchymoses of the lax scrotal tissue.

The drainage wick is removed on the second day. Most cases are up on the third or fourth day. The silkworm gut suture is usually removed on the eighth day. In many cases the catgut knot has worked out, and has delayed healing. If the two silkworm gut sutures prevent all bleeding from the dartos, as they usually do, the catgut suture of the tunica vaginalis may be omitted.

This operation has been enthusiastically reported by Clark, Culler, Eckels, Ashcraft, Cunningham and many others. They are all enthusiastic over the results obtained. Cunningham, in his series, found pus in the epididymis in over 75 per cent. of the cases. The organisms which have been found in the pus have been almost invariably gonococci, as Hagner demonstrated years ago. The testicle has generally been found free of involvement.

The advantages of the operation which have been claimed by various surgeons are the rapid relief of pain, disappearance of the acute swelling and edema, the almost immediate drop of temperature, and disappearance of constitutional symptoms with a marked drop in the leucocyte count, and the shortening of the convalescence, operated patients being able to be up within three or four days. This is one of the greatest justifications for epididymotomy. The urethral discharge usually recurs, but according to most authorities is not so profuse or severe as in the cases which are treated expectantly. The infection in the prostate and vesicles can be treated much more quickly, usually within two weeks. Recurrence is much less liable. Concerning the induration in the epididymis, Cunningham states that in his 57 cases the induration has seldom disappeared in less than two months; but the cases, which he has observed several months after operation, do not present the induration which is so commonly seen in the cases treated by local palliative measures. In reference to sterility, cases are reported in which after double epididymitis, in which epididymotomy was performed, there have been found spermatozoa in the expressed prostatic secretion, and children have been born to the wives of these individuals.

Cunningham presents observations on 6 bilateral cases; two later had children; two others show numerous spermatozoa in the secretion and two show no spermatozoa.

It seems from a review of this recent material, that the results obtained by the meningococcic serum and by epididymotomy are much more satisfactory and thorough than by the usual palliative measures.

DIAGNOSTIC AND THERAPEUTIC NOTES.

BIMANUAL EXAMINATION OF THE PROSTATE.—Haberland (*Zentralbl. fuer Chir.*, No. 16, 1914). The best method of obtaining an accurate notion of the size and shape of the prostate is by means of bimanual examination. The bladder having been emptied, the patient lies on his back, with his legs drawn up, breathing deeply with open mouth. The first finger of one hand is inserted into the rectum and palpates the posterior aspect of the symphysis, against which the anterior surface of the prostate lies. The fingers of the other hand press slowly into the hypogastrium, along the upper edge of the symphysis, until each of the two hands feels the pressure of the other. The prostate then lies between the two hands and can be accurately palpated, its size, shape and consistency being made out quite as readily as those of the uterus. It is nearly always possible definitely to distinguish between vesical calculus and prostatic hypertrophy.

STENOSING ATROPHY OF THE PROSTATE.—Dubs (*Beitr. zur klin. Chir.*, Vol. 90, No. 2). The writer again calls attention to a condition designated by French authors as "prostatisme sans prostate," prostatic obstruction without prostatic enlargement. The condition is one in which the symptom-complex is identically that of prostatic hypertrophy, but in which, anatomically, we find an abnormally small prostate. The cause of this atrophy is uncertain; the treatment should be a suprapubic prostatectomy. The gland is then found small and hard and imbedded in scar-tissue. The internal sphincter is converted into dense fibrous tissue and is responsible for the urinary obstruction. The internal sphincter is removed with the prostate, thus relieving the obstruction, while the external sphincter, which remains intact, suffices to secure continence.

CONCERNING ARTHIGON.—Rohr (*Dermat. Wochenschr.*, No. 36, 1914). Arthigon is a gonococcus vaccine, made by the Schering firm, according to a method devised by Bruck. In the dermatological clinic at Kiel, 133 cases of gonococcus infection of all kinds were treated by means of arthigon. In such cases, the injection is often followed by marked general and cutaneous reactions and, on the whole, the more violent the reaction the better the prognosis. Especially good results were obtained in epididymitis, arthritis, and prostatitis; prostatic abscesses were absorbed in a very short time. Since good results may be obtained in anterior urethritis from local treatment, the use of arthigon is not recommended in these cases.

The intravenous injection of arthigon has certain advantages over the intramuscular, and is to be preferred; both measures are harmless. Visual disturbances were observed in one case treated with an intravenous injection of arthigon, but they disappeared spontaneously after four days. An onset of epididymitis, more rarely of prostatitis, was observed in some cases immediately after an injection of arthigon for posterior urethritis. This he ascribes to a flaring up of the gonorrhea in the posterior urethra and its extension to the neighboring organs, and considers it a warning that arthigon should not be employed in such cases, especially as the therapeutic effect produced is very slight.

PYOGENIC INFECTIONS OF THE UPPER URINARY TRACT.—Chute (*Boston Med. and Surg. Journ.*, Sept. 3rd, 1914). The treatment of acute infections of the kidney for the less acute cases should be expectant. The very acute cases of pyelonephritis with miliary abscess formation will be benefited by decapsulation and occasionally by nephrectomy. Nephrectomy is so seldom indicated that it is only a very slight exaggeration to say that, in such cases, it should never be done. The underlying principle of the treatment of chronic infections is the securing of adequate drainage wherever conservative treatment is possible. In the simplest cases this consists in freeing abnormally tied down organs, or in fastening in place abnormally mobile ones. Sometimes various plastics are needed. The results obtained in some cases of chronic suppuration were very gratifying, but the writer's experience with conservative operations on kidneys, that have shown definite foci of chronic suppuration, has not on the whole been encouraging. The removal of a suppurating kidney in the presence of a well fellow is attended with far more brilliant results.

SYPHILIS OF THE LIVER IMITATING CIRRHOSIS.—Cheney (*Amer. Journ. Med. Sc.*, August, 1914). Within the last two years, 6 cases, showing the clinical picture of cirrhosis of the liver but clearly syphilitic in nature, have been observed in the wards of Stanford University Hospital. From their study, Cheney draws the following conclusions:—

1. In any case that appears to be cirrhosis of the liver, judging from clinical history and physical signs, the blood should always be examined for syphilis. If the Wassermann reaction is positive, vigorous specific treatment will often produce marvellous improvement not to be expected in any other way.

2. There is no certain way to tell which case of hepatic cirrhosis is luetic and which is not. There may be nothing about the condition of the liver on physical examination, or the symptoms it produces, to determine the etiology or to distinguish ordinary portal cirrhosis from luetic.

3. Syphilitic cirrhosis of the liver is a common form of hepatic disease, and must never be forgotten in the differential diagnosis of any case where symptoms and signs point to the liver as the organ involved.

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EDITORIAL.

WILL AND SHALL.

Some months ago an incident happened in London that should bring home forcibly to everyone how very important it is to use the words 'will' and 'shall' properly. A lady, driving her motor-car through a crowded street, was stopped by a policeman, evidently for not obeying the traffic laws, and when the lady was allowed to proceed after a satisfactory explanation she addressed the policeman thus: "Now move them [the crowd] out of the way, or I will drive over them." What the result was, was quite surprising, for the crowd with a perspicacity that is greatly to their credit, since it proclaimed them first-class grammarians, objected so fiercely and vociferously to the misuse of the word "will" that a small riot followed, which was only quelled by the quick interference of a number of policemen. This incident, while not of a magnitude to arrest the world's attention, is nevertheless fraught with a lesson that all should heed, for had the lady been a grammarian and with ears attuned to the fine distinction between the words 'will' and 'shall,' she would never have been subjected to the insults of a crowd, or have been the subject of much unfavorable criticism in the London press.

No doubt some impatient reader is already wondering what the proper use of 'will' and 'shall' has to do with the practice of medicine, or for that matter with the success or failure of a physician's career. Granted that while these apparently innocent words are certainly not of the importance of medical terms of Latin or Greek origin, it must be admitted by all that we have used them more indiscriminately than any other two words in our language, in fact,

with so decided a disregard of their real value that even the slightest criticism of our misuse of them has been resented with heat, so deeply are we hurt when called to account for what we consider a very negligible misdemeanor. But though we may make light of the real importance of these two words, let no physician be so foolish as to think that the time will not come in his career when he will be taken to task quite severely for having perpetrated an untruth on his patient or, in case of his patient's death, on the unreconcilable family. Of course, he will enter an indignant rebuttal to the effect that he told the truth to the best of his ability, and that it was only the deep ignorance of his patient or the family that prevented them from seeing what a very righteous man he was. A riot, there may not be, as in the lady's case aforementioned, but is not the fact of being branded as a prevaricator, nay as one who prefers untruth to truth, harmful and humiliating enough? So let us pause long enough to find out by what simple means the medical man of slight grammatical knowledge can bring upon himself the odium of a perverter of truth by the wilful misuse of 'will' and 'shall.'

Let us suppose that the patient is a very sick man, and that the physician knows and the family knows and even the neighbors know that the chances of recovery are small. Would he be justified in saying to the sore-perplexed family: "I will try to cure him"? Again let us suppose the patient must undergo an operation or a cure is impossible. Have not all of us heard the remark: "My dear madam or sir (as the case might be), your son is very ill; an operation is the only hope; if you will give your consent to this, I will cure him." Now these are dreadful mistakes, too dreadful to contemplate in a spirit of calmness. But how about the lighter side of a physician's life, the manner in which he keeps appointments with his patients, his assistants, his nurses? "Nurse, in case the patient gets worse, telephone me at once and I will come"; "yes, yes (this over the telephone), I will be at my office at nine sharp"; "have all the instruments ready (this to his assistant), as I will operate at two o'clock. I will leave early so as to be there on time," are some of the ungrammatical speeches that fall from a physician's lips not once but many times during the day; and if one had the temerity to say to him: "My dear sir, you are telling many untruths, either unwittingly or with a wilfulness that is almost criminal," would not his indignation be beyond bounds? And yet he is guilty, not because he fails to be a purist, a meticulous stickler for the right word, but because he is leading another astray

by speeches that he should know contain promises which cannot always be kept.

But of all his speeches, which we would condemn, the worst is summed up in that pet phrase of so many physicians: "I will cure you." We have no statistics on hand to show how much more often "I will cure you" is used than "I shall cure you"; but depending only on memory and many wretched moments when we have stood appalled at a physician's audacity or lack of the fine distinction between these two much-abused phrases, we feel justified in saying that on account of the great popularity of the former, the latter, were it bold enough to force its way into conversation with greater frequency, would soon be hustled to the distant limbo frequented by all pariahs. But let not the physician delude himself with the thought that without let or hindrance he will continue in the path of dalliance that is so generously sprinkled with 'I will.' For some day there will be a rude awakening; and, surprise of surprises, the scathing criticism may not come from a college professor who has made a study of the English language, but from some rather simple person, a clerk or perhaps a scrub-woman, who will know instinctively that the physician fibbed when he said "I will cure you," just as the crowd in the streets of London knew that the motorist had designs on their lives when she said "I will drive over them" instead of "I shall drive over them." And let us hope that when the awakening really takes place, the physician will recognize at once how foolish he has been in the past to expose himself to the shafts of criticism by neglecting to ascertain most thoroughly the true significance of those two precious words, 'will' and 'shall.'

P. S.

THE GREAT WAR AND THE DECLINING BIRTH-RATE.

It stands to reason that as long as the European war lasts the birth-rate will be reduced in Germany, France, England and Austria-Hungary, our calculation being based on the virtue of the husbandless women and the good behavior of those oafs who have escaped military service for one reason or another. But what has not entered into the wise heads of those Powers, who use their men as a human defensive wall when the war dogs are let loose, who seem to think that because a human being has some liberty and some privileges and has the right to make a living in times of peace he must be surcharged with the sort of patriotism that drives one into the thick of the fight to be shot down simply for the gratification of the whim of some General, is the outstanding

fact that after peace has been declared there are going to be born a number of new ideas that will no doubt militate against any repetition of the wholesale slaughter which is characteristic of the present war. And since the present gigantic misunderstanding is really a war of ideas, why should not the future life of the handful of men who will have the luck to return to their respective countries unscathed, and of the generation that is about to enter manhood, be more deeply influenced by the new ideas than by any teachings from those inured to the military idea? Following this line of thought, is it at all surprising that the enlightened women of Europe are already talking and writing on the subject of how to avoid war in the future, and are quite ready with a theory that the only way to stop the carnage is to stop bearing children? At least, Mme. Rosika Schwimmer, of Budapest, and Mrs. F. W. Pethick-Lawrence, of London, who are at present lecturing in this country, are of this opinion, and being women of more than ordinary intelligence it would be well for all those medical men who have been bemoaning the declining birth-rate in all countries to pay heed to this special tenet in their propaganda.

If we were as clever at remembering the number of books written on a certain subject as are so many writers who delude the public with the sonority of their supposedly authoritative statements, we would say that in recent years no subject has been honored with so many books, booklets and articles as has the matter of declining birth-rate. Perhaps we are exaggerating the number; perhaps there are other subjects that have received like attention, and even more; but even so we are firm in the belief that the declining birth-rate has been wept over by more sentimental medical writers than has any other topic of interest. What sameness all the books and booklets and articles have had! We are told of the immorality attached to the prevention of conception, of the degeneracy that would surely follow in its wake, how nations that practised it were not the equal of those who encouraged from eight to ten children in families that could barely support two, how superior in every respect quantity was to quality! And all along we knew that the writers were sycophants and hypocrites, and that they were not inveighing against the well-to-do but against the working classes, so that more and more burdens would be theirs—the feeding of many mouths and then the feeding of that awful maw which we are being told to-day must be filled to overflowing, or patriotism will be a word to be shunned by all decent people. In short, all the books that have come to our desk have been a

belaboring of the poor lest they too imbibe the ideas of the prosperous, forgetful, however, of the pithy legend under one of Alphonse Lévy's most striking cartoons—namely, the exclamation of a poor woman: "*Ca c'est pour les riches.*"

As purveyors of decent thought we are not advising the prevention of conception, but rather the abolition of class distinction in all future books and articles on the declining birth-rate. If the respectable and respected physician can give advice to his wealthy clientele, and he does so despite his asseverations to the contrary, he can do the same for the poor. The latter really need his advice more than the former; and even though he may not receive any pay, his duty really lies with them, for if he is intelligent he must know that the poor, more than the rich, on account of economic reasons, need his kindly words, and also because in their ignorance they resort to desperate remedies only when it is too late. But what would be better, and what we would like to see in the future, is a large number of children in all families, even in doctor's families, so that all fathers and mothers would know how simple a matter it is to bring up, say, ten children, especially when the domicile consists of two rooms and the wages brought home by the wage-earner barely suffice to feed a childless couple. P. S.

DRUG STORES AND THEIR INSTRUCTIVE WINDOWS.

Perhaps the reader of these lines is quite obtuse to the window displays of our drug stores, hence pays scant attention to them. Perhaps, when he saunters along the streets of our cities, his mind is so wrapped up in other and more important matters that he has no time to scan what is in his immediate neighborhood. But let this same obtuse individual hear that there is a picture in the window of an art store that has been very much talked about, and it is not many minutes before he is safely planted in front of it, studying it from many points of view, and, in case it is one of extreme nudity, deploring the licence of an age which grants an art dealer the privilege of descending to such depths of immorality. And yet the picture that depicts the half-draped female figure, or its complete nudity, is not nearly so offensive as what is daily on view in the windows of every drug store in this country.

Just why a drug store should fill its windows with fountain syringes and suspensories and other decidedly objectionable things and go uncriticised, is one of those mysteries that can be solved only by the Puritanic mind that sees vulgarity in things that are

not vulgar, hence is the real purveyor of evil thoughts and the quintessence of indifference in the presence of what must smite every passer-by in the face. But the fact is that whether we are right or wrong in attributing the continuance of this outrage on common decency to the peculiarities of the Puritanic mind, drug stores flaunt their objectionable wares with an audacity that seems to recognize no bounds. Strange folk we are, indeed! When a quack advertises his name in large and alluring letters, and mentions the diseases which he can cure, we hold our hands before our eyes lest the immorality of his sign penetrate too deep into our inner consciousness and wreck the moral structure that keeps us from temptation; but with a nonchalance that is laughable we enter a drug store that makes boast of fountain syringes and suspensories by displaying a whole windowful, buy soda, or candies, or some other trifle for the members of our family who are with us, chat with the proprietor on a basis of social equality, and after making our purchases, do not hesitate to stand outside directly in front of the most objectionable window, not with our backs turned to it, but facing it with no blush of shame on our faces, though it may be that some wee object, quite innocent, to be sure, that the ingenuity of the proprietor has prompted him to place among the syringes and suspensories as a lure for those who are not specially interested in these household commodities, is holding our attention. Strange folk we are, indeed!

What reforms would we institute to make the drug store window of that base morality which the prurient mind invariably attaches to a display of pictures in an art dealer's store. Perhaps, a half-draped female figure indicative of health and holding on high a much-vaunted tonic, a few good engravings of celebrated chemists, a few drugs and occasionally a comic picture depicting some phase in the art of compounding medicines might be used and with some effect, whether we judge this sort of display from an artistic standpoint or from a moral one. And even though the Puritanic mind might object and criticise in its usual way when it fails to see the customary syringes and suspensories in the window, the general public would give a sigh of relief, the public that is clean and sane and without any prejudices. But why hope for any radical change in the near future when custom holds us in taut leashes, and any reform is howled down that might make deep inroads into a smug respectability that sees naught but harm in a revolution that has for its object a greater appreciation of the artistic.

P. S.

OPINION AND CRITICISM.

THE PASSING OF VESALIUS.*

"*Doch wer möchte an den Geiz Vesals glauben?*" asks Roth, and so dismisses the whole matter. But whatever we may think, it is certain that some people did believe that Vesalius was avaricious. The real matter of moment is, what were the grounds upon which their belief in his avarice was based? The statement of Solenander (written in 1566) is, according to Roth, practically identical with that of Clusius, and may therefore be considered along with the latter. Metellus (15th April, 1565) adduces three proofs in support of his assertion that "Vesalius would do anything for money" — (1) he went to Jerusalem in order to win a bet; (2) to save money he travelled with pilgrims and not with merchants; and (3) through stinginess he did not provide enough bread and water for the voyage. Now his first point has been shown to be false, and the second falls with it, for without speculating as to the most appropriate society for a betting man, there will be general agreement that pilgrims are the most suitable company for a pilgrim. As to the alleged insufficiency of supply, this matter will be fully discussed later; here it must suffice to say that a satisfactory explanation is available. So far, therefore, as Metellus is concerned, the proofs of avarice utterly fail; *tabulæ solvuntur risu*. Clusius, like Metellus, insists upon the parsimonious supply of food, but he also supports his allegation of avarice by referring to the loaning of money at Madrid and to the troubles with the Customs at Perpignan. It is necessary, therefore, to examine both these incidents in the full light of contemporary facts.

Notwithstanding the fabulous wealth flowing into Spain, through which the courtiers profited greatly, many of the nobles were often in dire straits for money. Expenditure ever tended to outrun income, and where fortunes were easily made the practice of economy had few attractions. As to the Flemings, they held much the same place in Madrid as the Scots did fifty years later at the Court of James I.; rich in ancestry but poor in patrimony, they were come to make their fortune in any way their nimble wits could devise. Among the younger gentry of this sort elsewhere the usual refuge was the professional money-lender. This was not possible in Spain, for the professional money-lender had disappeared with the expulsion of the Jews in 1492. The only hope of accommodation was to be sought at the hands of a kind-hearted friend who had current

*Andreas Vesalius was born in Brussels, December 31st, 1514.

coin to spare. Under these circumstances the excellent financial position of Vesalius almost inevitably led to solicitation from him on the part of his needy fellow-countrymen. That he consented to lend money was, in contemporary opinion a praiseworthy and charitable action.

But the charging of interest was quite a different matter. This was generally regarded as infamous. The preamble of an English Act of Parliament passed in 1570 declares that "all interest being forbidden by the law of God, is sin and detestable." The whole usury legislation of the Middle Ages was based on this view, which had been transferred from the Jewish Law and enshrined in the Christian Canon Law. Accordingly the complaint of the nobles that they had been charged interest could have only one meaning to the man in the street—that Vesalius was a miser. So the rumour of his avarice arose.

But however uncompromising the popular opinion might be in regard to interest, the Canon Law prohibition of it was not absolute. This prohibition was based upon the theory, which was as old as Aristotle, that gold was a barren breed of metal; that from itself there could come no increase. The unproductivity of gold was indeed so universal that when banks were first established depositors paid for the privilege of having their money safely kept therein.

In particular places, however, owing to the development of commerce, gold began to be productive, and consequently the canonical prohibition of interest was shaken. Thus a loan invested in freighting a ship was entitled not merely to the return of the capital lent, but also to a proportion of the profit as well. In such localities money was no longer barren, and so even a cash loan to a friend could be legitimately burdened with an interest not inferior in amount to what the money would have earned had it been used, say, in trading. This was the case in Spain, where shipping ventures with America had become frequent and very profitable. According to Canon Law, therefore, Vesalius was quite justified in asking interest, and it is inequitable to charge him with avarice on that account.

Still more halting is the proof drawn from Perpignan. Farmers of taxes have from time immemorial served as a synonym for rapacity. In this respect the Custom officers of Spain in the sixteenth century might well have stood for the very pattern of their despicable tribe. Clusius himself refers to them as Harpies. Nicolaus Clenardus (1566), when speaking of the dangers of travel in Spain, mentions robbers and Custom officials in the same breath, but adds the sarcastic distinction that no one could hope to escape the depredations of the latter. The Ambassador of Henry VIII. complains loudly and frantically of the outrages offered by them to his person and office. So did the envoy of Elizabeth, but the officers grimly said "that if Christ or Sanct Francis came with all their flock they should not escape." If to have trouble with the Spanish

Customs were a sign of meanness, then of a surety no liberal soul passed their way.

And thus the unsubstantial fabric of accusation breaks down upon examination. This much at least may be urged in actual disproof, *viz.*, that he recklessly spent large sums in printing and illustrating his *Anatomy*, the financial return from which he must have anticipated would, through the action of the Galenists, be extremely problematical. Paré (1561) merely expresses the honest conviction of contemporaries when he places Andrew's liberality on the same high plane as his diligence: "*Wésal, auquel la république est grandement atténue, tant par sa grande diligence que pour les grands frais qu'il a soutenus en l'œuvre de son anatomie.*"

* * * * *

But the friends of Vesalius determined to raise some slight memorial to his name near the spot where his body lay. The most suitable place was the churchyard of the Franciscan Convent referred to, and here, in fact, the monument was erected. Christopher Fuerers von Haimendorff actually saw it there on the 4th of August, 1565, and the inscription he records is the same as that given by Miraeus. Too much stress need not be put upon the error of age—58 instead of 50—which might easily arise from a mistake in transcription. Over the epitaph was his coat of arms—three greyhounds *or*, in a field *gules*, surmounted by the imperial double-headed eagle. Here, again, the traveller made a slip, since we know that the real coat of arms bore three weasels. This also is of little moment, since to those unskilled in such things it would be difficult to distinguish an heraldic weasel from a conventional greyhound.

The soil of Zante is, however, singularly unsuited for the conservation of monuments. The island is indeed remarkable for the frequency of its earthquakes, through which the Franciscan Church has again and again been cast down. More devastating than any earthquake was the invasion of 1571, when the Turks seized and overran the land, slaughtering all the inhabitants and burning or destroying every building. With such facts in mind it is easy to account for the disappearance of the memorial to Vesalius. As early as 1586 we find Zuallardo declaring that no vestige of it remained. Two of *Purchas his Pilgrims*, *viz.* George Sandys and Thomas Coryate, landed on the island in 1610 and 1613 respectively, and they have left on record a fairly full account of what they saw, but neither heard a word in regard to this tomb. The fact faded so quickly from men's minds that even tradition grew silent. Sixty years ago the Belgian Government, wishing to commemorate their illustrious compatriot, made inquiry in Zante, but the official search through State archives and church records was fruitless. There was not a syllable in them relating to Vesalius or his grave.

One of the proposals for the celebration of the four hundredth anniversary of his birth had reference to the erection of a monument to his memory on the soil where his ashes rest. But alas!

men's thoughts are so completely occupied with the Armageddon of the present that there is no room for the consideration of so pious and peaceful a project. And yet when all this awful carnage has become merely a hideous memory, and the torrent of human blood has incarnadined the rose and the poppy, may we not hope that the Belgians will turn with renewed ardour to venerate one who was the saviour and not the destroyer of men? But after all it matters little whether the world has one statue more or less, for no monument that artistic skill might erect to Vesalius could compare with his own achievement. His name may fade and his reputation grow dim; his work at least is imperishable. To it may be applied the motto of his choice: *Vivitur ingenio, cætera mortis erunt.*

Edinburgh Medical Journal.

G. Matheson Cullen, M. D., B. Sc.

LITERARY NOTE.

Those readers of fiction, who are a bit tired of reading about the self-sacrificing physician who gives up a lucrative practice to devote all his time to the poor, will be delighted to encounter a medical man who was very much like other mortals, in so far as he was a human being with human appetites. The hero of "One Man's Way" by Evelyn Dickinson (George Allen and Co., London) would never have been considered by his confrères as a scientific product, but he might have been considered a very likable man of some intelligence, who went through life, as most of us do, with little thought of what our mission really is and of the importance of outside criticism to fashion our careers. That he came very near being shipwrecked, morally speaking, is greatly in his favor, for it shows that when the critical time came he was not made adamant against temptation by dryasdust philosophy or by fleeing to that haven of peace and respectability so graphically pictured in most novels in which the hero is a physician—life among the poor in tenements. Now it is a fact that when a physician rises above temptation he does so because he is strong of mind and not because his medical training stands him in good stead, and that when he falls it is not because of any lack of this same training, but because even a physician may at times be forgetful of his duty to his family and to the uplift of his immediate surroundings. And just because this book has a decided human note we would recommend it to all physicians, if only for the reason that it is well to see ourselves in the same circumstances as other human beings, and to note that our behavior is not a bit more praiseworthy than that of the man in the street, albeit we have had the advantage of the supposedly strengthening power of medical science. As a literary production, "One Man's Way" does not rank high, but as a counterblast to the twaddle contained in most novels in which physicians figure as heroes, it cannot be praised too highly.

ORIGINAL ARTICLES.

THE USE OF CHOLESTERINIZED ANTIGENS IN THE WASSERMANN REACTION.*

By ROBERT GOLDSBOROUGH OWEN, A. M., M. D., of Detroit,
AND
HENRY SNURE, M. D., of Detroit.

In the original Wassermann method the antigen used was made from a syphilitic fetal liver, because at that time the *spirochæta pallida* had not been grown in pure culture, and as such a tissue was known to contain numberless spirochetes, it was thought to be the nearest approach to a pure syphilitic antigen.

Subsequent work, while it has shown that the Wassermann reaction is not a true antigen-antibody reaction, in the sense of syphilitic antibodies joining with the *spirochæta pallida*, has demonstrated that the test is of the utmost diagnostic value. In syphilitic conditions there is an increase of some unknown substance, which may be called the Wassermann body and which acts as a true antibody in combining with various tissue extracts and fixing complement.

Experiments made with an antigen composed of pure cultures of the *pallida* have not given as regular and uniform results as where a tissue extract has been employed. While true syphilitic antibodies are undoubtedly generated in the course of the disease, apparently the increase in the so-called Wassermann body is more constant and more uniform. Some investigators have suggested that the reaction with both antigens should be employed, the reaction with the *spirochæta pallida* antigen giving an index of the patient's resistance, while the amount of the Wassermann body present gives an index of the severity of the infection. However, we do not consider this theory tenable, as we know that the strength of our reaction, as determined with a tissue extract, is by no means a true index of the severity of the infection as judged by the clinical course and symptoms.

The original Wassermann antigen was an aqueous extract of a syphilitic fetal liver, but such extracts varied greatly in their anti-

*From the Serological Department of the Detroit Clinical Laboratory.

genic qualities, and moreover often deteriorated greatly in a short while.

Marie and Levaditi,¹ Porges and Meier,² Landsteiner, Mueller and Potzl,³ Michaelis and Lesser,⁴ and a number of other observers introduced the use of alcoholic extracts, first of syphilitic tissues and then of normal ones. Owing to the difficulty of securing syphilitic fetal livers and to the uncertain results obtained from different liver extracts even when prepared by identical methods, a number of men began to use alcoholic heart extracts; human, beef and guinea-pig tissue being used.

Boas⁵ tested fifty-five syphilitic bloods against an alcoholic extract of human heart and a standard watery extract of syphilitic liver. All the bloods were positive with the heart extract, while only forty-nine gave such a result with the liver preparation. Forty-three non-luetics all gave negative results with both antigens. Boas made antigens from thirty-six syphilitic fetal livers and found only four which were suitable. The antigenic value bore no relation to the number of spirochetes in the original tissue. On the other hand, forty alcoholic human heart extracts tested by Thomsen⁶ gave identical results. Boas states that heart extracts tend to lose their strength after a varying period of time and that they are also inclined to become anticomplementary. He therefore makes a fresh alcoholic extract each week. In our own work we have found that our heart extracts tend to retain their activity over a considerable period of time, but they should be tested occasionally to make sure that they are still potent. The extracts should be tested for anticomplementary action each week as we have occasionally had an extract develop such qualities rather suddenly.

The various artificial antigens can be dismissed with a few words. They offered no advantages over the alcoholic extracts and were very uncertain in their action, satisfactory results being confined mostly to their originators.

The next advance in the study and preparation of antigens we owe to Noguchi,⁷ who assumed that the active antigenic substance in the various tissue extracts was lipoidal in nature, and by extracting various tissues, normal or syphilitic with alcohol and then with ether, subsequently fractionating with acetone, he obtained an antigen singularly free from hemolytic and anticomplementary action, and which, owing to the absence of these invidious characteristics, permitted the employment of an amount containing many times the minimum quantity required to produce fixation with a positive blood. While the watery and alcoholic extracts were used in quantities one-half of their inhibiting strength, the Noguchi standard demands that four times the amount used in the test shall be neither hemolytic nor anticomplementary, while it must react with positive bloods when used in quantities of at least one-fifth the

amount employed in the regular test. In other words, five antigen units are added to each specimen tested.

Noguchi and Bronfenbrenner,⁸ however, found wide variations in the antigenic properties of their acetone-insoluble antigens, but an analysis of over 100 specimens showed about 50 per cent. to be serviceable, while 5 per cent. were valueless owing to lack of antigenic power.

Browning and McKenzie⁹ compared antigens made of lecithin extracted from beef liver, with a crude alcoholic extract of the same organ, and found the latter slightly better. When cholesterol was added to the lecithin, an antigen was obtained superior to the lecithin extract alone or to the crude alcoholic preparation. Cholesterol alone they found possessed no antigenic properties.

Sachs¹⁰ was the first investigator who tried the effect of adding varying amounts of cholesterol to alcoholic extracts of beef hearts, and then comparing these preparations with a standard antigen. He found that cholesterol beef-heart extracts were fully as good as the very best fetal liver extracts obtainable.

McIntosh and Fildes¹¹ compared the results obtained by using a cholesterol reinforced alcoholic human-heart extract (5 parts alcoholic extract + 4 parts 1 per cent. alcoholic solution of cholesterol) and plain alcoholic extracts of human heart, of syphilitic liver and the cholesterol lecithin extract of Browning and McKenzie. They found that the cholesterol heart extract was far superior to the others. They made cholesterol reinforced extracts from twenty-four different human hearts and found them to vary very slightly in their antigenic and anticomplementary action.

Realizing the great importance of securing a standard antigen for all serologists if different workers are to obtain constant and uniform results, Walker and Swift¹² took up and greatly amplified the work of Sachs and of McIntosh and Fildes.

If then, as asserted by McIntosh and Fildes, human heart extracts reinforced with cholesterol are so nearly uniform in antigenic strength and in anticomplementary action, and at the same time superior to the various antigens in use, we have in such preparations the ideal standard antigen.

Walker and Swift, therefore, undertook a series of experiments to determine the best amount of cholesterol to be added to tissue extracts and what tissues furnished the best antigens when thus reinforced.

Their technique was a slight modification of the original Wassermann test, employing one-half the amount of the various reagents used in the original method. Complement and amboceptor were carefully titrated each day.

The crude alcoholic extracts were prepared by mincing the tissue, and then extracting with absolute alcohol in the incubator for

two to three weeks, shaking the bottles daily. 10 c.cm. alcohol were used for each gram of tissue. The extracts were cooled to room temperature, filtered and kept at this temperature. If a precipitate formed, the extract was refiltered.

They first determined the amount of cholesterol taken up by the crude alcoholic extracts of the different tissues and found that it varied between 0.72 and 0.9 gm. per 100 c.cm. A saturated alcoholic solution of pure lipid from fetal liver took up twice this amount. Fresh emulsions of the various extracts were made in normal saline in the proportion of one part of extract to five of saline. The extract was added drop by drop with constant shaking.

Sachs and Rondini¹³ demonstrated that the way in which an alcoholic extract was mixed with saline changed its physical properties, as slow mixing gave a heavy emulsion, while rapid mixing produced a colloidal suspension. The former was more anticomplementary and also possessed higher antigenic power. McIntosh and Fildes, however, showed that the manner of mixing made no difference in the strength of their cholesterol antigens, and Walker and Swift were able to confirm this statement.

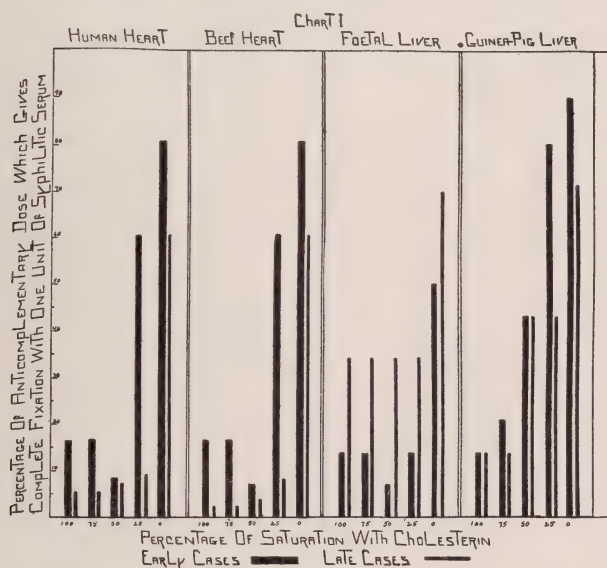
Walker and Swift prepared cholesterol saturated extracts by adding an excess of cholesterol to the crude alcoholic extracts of the various tissues, incubating for twenty-four hours, and after cooling to room temperature, filtering off the excess of cholesterol. The difference between this amount and the amount originally added gave the amount of cholesterol absorbed by the extracts, which, as stated above, varied between 0.7 and 0.9 gm. per 100 c.cm. By diluting the cholesterol saturated extracts with proper amounts of the original extracts free from cholesterol, they prepared three-fourths, one-half and one-fourth saturated solutions. The cholesterol free extract was also tested in the same way as the others.

They first used an emulsion made by adding one part of extract to five parts of normal saline. With such emulsions of all strengths of the different tissue extracts, they determined the anticomplementary dose, and found that cholesterol even in saturated solution increased the anticomplementary action but slightly. Beef and human heart were found to be slightly more anticomplementary than guinea-pig heart or fetal liver. They determined the point at which beginning fixation began with non-syphilitic sera and the point of complete fixation with serum, from early and late syphilis, and the percentage ratio of such amounts to the anticomplementary dose. The following chart shows the amounts of the different extracts required to give complete fixation, expressed in percentage of the anticomplementary dose.

In their preliminary work, as shown by the chart, Walker and Swift found that the beef-heart cholesterol extracts were of the same strength as cholesterol human-heart extracts in secondary syphilis,

and a little more sensitive in late cases when tested against one unit of syphilitic blood, but in testing the different tissue extracts against a series of bloods, they found the human-heart extract to be superior. We found that less of the cholesterin human-heart extract was required to fix one unit of syphilitic serum from both early and late cases, and also that such an antigen gave the highest percentage of positive results when tested against a series of syphilitic bloods.

The chart shows that saturated, 75 per cent. saturated and 50 per cent. saturated cholesterin heart extracts gave fixation in amounts 16 per cent. or less of the anticomplementary dose. In late syphilis even less of the cholesterin extracts were required than in early cases. It will be observed that while fetal-liver extract gave ap-



proximately the same results with serum from secondary syphilis, it was greatly inferior to the heart extracts in cases of late syphilis, the latter class including tabes.

The fourth division represents the results of similar experiments with guinea-pig liver extracts and shows the marked inferiority of the preparations made from such tissue. Walker and Swift also tried the effect of adding cholesterin to Noguchi's acetone-insoluble antigens, but the extracts thus made were valueless.

An analysis of this chart shows clearly the superiority of the heart extracts over those made from fetal or guinea-pig liver. Since the liver extracts absorbed a larger amount of cholesterin than did the heart extracts, this superiority cannot be due to the difference in cholesterin content, but is attributed by Walker and Swift to some peculiar lipid found in heart tissue and not in liver extract.

Having noted that the heart extracts are the best, a further analysis of the chart will show that the 50 per cent. cholesterolin saturated extract was more sensitive than the others in secondary syphilis, and almost as sensitive in late cases. Moreover, emulsions of the 100 per cent. and 75 per cent. cholesterolin saturated extracts were very milky so that exact readings of the degree of hemolysis were difficult.

These experiments showed clearly the value of the cholesterolin reinforced antigens and also that about a 50 per cent. saturated solution was the best strength to use. Such a 50 per cent. saturated solution contains about 0.4 grm. per 100 c.cm. The direct addition of this amount of cholesterolin to the alcoholic tissue extract gave slightly better results than did the preparations made after the directions of McIntosh and Fildes, who first dissolved the cholesterolin in alcohol and then added this solution to the original extract in such proportions that the mixture contained about .44 per cent. cholesterolin.

After determining the proper amount of cholesterolin to be added to tissue extracts, Walker and Swift made up .4 per cent. cholesterolin extracts from several human hearts, a beef heart, guinea-pig hearts and fetal livers, and compared the results obtained with such extracts with those given by three standard antigens; one a .25 per cent. cholesterolin extract of fetal liver, the second an ether extract of human heart (Lesser), and the third an alcoholic extract of fetal liver standardized by Wassermann.

1 to 6, 1 to 10 and 1 to 30 dilutions in saline were made from the cholesterolin extracts and tested against a number of syphilitic and non-syphilitic sera. Testing 22 normal sera, the 1 to 6 emulsions gave 3 + and 3 \pm reactions. The 1 to 10 and 1 to 30 dilutions gave uniformly negative results with these bloods. Walker and Swift therefore advise the use of a 1 to 10 dilution in their method; 0.5 c.cm. of such a dilution is employed.

The syphilitic bloods which Walker and Swift tested were nearly all from treated cases. All the untreated cases, secondary and tertiary, gave complete fixation with all the antigens. They divided the cases into early (within three years after infection) and late, the latter class including tabes.

Testing sera without regard to the stage of the disease, using the 1 to 10 dilutions of cholesterolin reinforced heart extracts, human and guinea-pig, they obtained 57 per cent. of strongly positive reactions; 45 per cent. with the beef heart, 25 per cent. with their standard antigen, and 27 per cent. with the Lesser and Wassermann antigens. Thus the addition of the proper amount of cholesterolin to human and guinea-pig heart extracts gives an antigen twice as good as any other antigen obtainable. When a 1 to 30 dilution was used, about 35

per cent. of positive reactions were obtained against 25 per cent. with the three standard antigens mentioned above.

The great value of the cholesterin antigens, however, lies in their sensitiveness to sera from late cases, for while more sensitive than the usual standard antigens to secondary sera, the difference is most marked in that class of cases where the Wassermann reaction most often fails to give the expected positive result. Thus they got 64 per cent. of strongly positive reactions in late syphilis with a 1 to 10 dilution of cholesterin human heart against 25 per cent. with their standard antigen. In early syphilis the figures were 49 per cent. and 23 per cent. respectively. It should be borne in mind that most of the sera were from treated cases, which accounts for the low per cent. of positive results found with all the antigens.

The cholesterin human heart and guinea-pig heart extracts were practically equal in efficiency and were superior to beef-heart extracts, which in turn were much superior to liver extracts. A 1 to 10 emulsion of cholesterinized liver extract gave only 28 per cent. of positive reactions in early syphilis and 37 per cent. with sera from late cases.

The same strength of cholesterinized heart extract was also far superior to the standard antigens when tested against cerebrospinal fluids.

Kolmer, Laubaugh, Casselman and Williams¹⁴ have compared in a most thorough manner a large number of antigens, and place the .4 per cent. cholesterinized human heart extract above all others, ranking cholesterinized guinea-pig and beef-heart extracts next. They found all three to be more sensitive than a standard alcoholic luetic liver extract. In fact, they think that such antigens are so delicate that + and ± reactions (25 per cent. and less of inhibition) should be considered of significance only where a definite luetic history is obtained. However, with human heart extract they got but one + reaction in testing 20 normal bloods, while a comparison of such a preparation with their standard luetic liver extract when tested against syphilitic bloods showed 58 per cent. of equal strength, reactions 29 per cent. of stronger, and none which were weaker. Three sera gave positive results with cholesterin human heart, which were negative with the plain alcoholic fetal liver antigen.

These 3 cases were as follows: 1 case (4+) specific optic neuritis; 1 case (4+) tertiary lues; 1 case (4+) tertiary lues, history positive.

With cholesterinized antigens they feel that a + (50 per cent. of inhibition of hemolysis) means lues; + (25 per cent. inhibition) the same in connection with a luetic history, while such reactions and those of lesser strength should not be considered as absolutely diagnostic with a negative or doubtful history.

McIntosh and Fildes in their work disregard all weak or doubtful positive reactions. Schamberg, Kolmer, Ringer and Raiziss,¹⁵ investigating 48 cases of psoriasis in connection with the Wassermann reaction, found 5 which gave at least 50 per cent. of inhibition of hemolysis with syphilitic liver extract and also with cholesterinized tissue preparations. They also obtained 2 (+) and 1 (\pm) reactions with the cholesterin antigens.

What the significance of these findings in psoriasis are it is not the purpose of this paper to discuss, but it should be noted that where the cholesterin antigen gave a ++ reaction, the alcoholic fetal liver preparation did the same.

Thomas and Ivy¹⁶ severely condemn the cholesterinized antigens as giving varying degrees of inhibition in conditions other than syphilis and with normal sera.

They state that they used one-third the anticomplementary dose of a saturated cholesterin extract. We have shown, as have Walker and Swift, that one-half saturated solutions are just as sensitive while less liable to give false results. Since Thomas and Ivy fail to give any detailed reports of the cases reacting positively to the cholesterinized antigens and negative to the syphilitic liver extracts, and do not mention the degree of inhibition, it is impossible to discuss their results intelligently.

We have always contended that, whatever antigens be employed, an absolute diagnosis of syphilis should never be made from a + (25 per cent. inhibition of hemolysis) or \pm reaction alone. Such reactions in known treated cases, however, are of great significance.

Owing to the fact that many of the specimens of blood submitted to us for examination are obtained by the patients' own physicians, some of whom are not in a position to withdraw the blood from a vein, it has been necessary to devise a system requiring a minimum amount of blood. We therefore use a system in which the total volume of our reagents is 1 c.cm. We use enough sheep's blood so that the final volume represents a one per cent. suspension; 0.02, 0.03 and 0.04 c.cm. of inactivated patient's serum are used.

Complement and amboceptor are standardized against each other daily and one unit of each used in the test. The amount of complement used is 0.015 c.cm. It will be observed that we are using approximately $1/5$ the amounts of the various reagents employed in the original Wassermann method, and a comparison of the results obtained by our technique and the original Wassermann method has shown its accuracy. All bloods were tested for natural sheep hemolysins, and when present they were removed by absorption with sheep cells.

Our standard antigen was an acetone insoluble preparation of

beef heart, prepared according to Noguchi. 0.1 c.cm., the amount used in the test, contains at least 5 antigen units when tested against a secondary syphilitic serum.

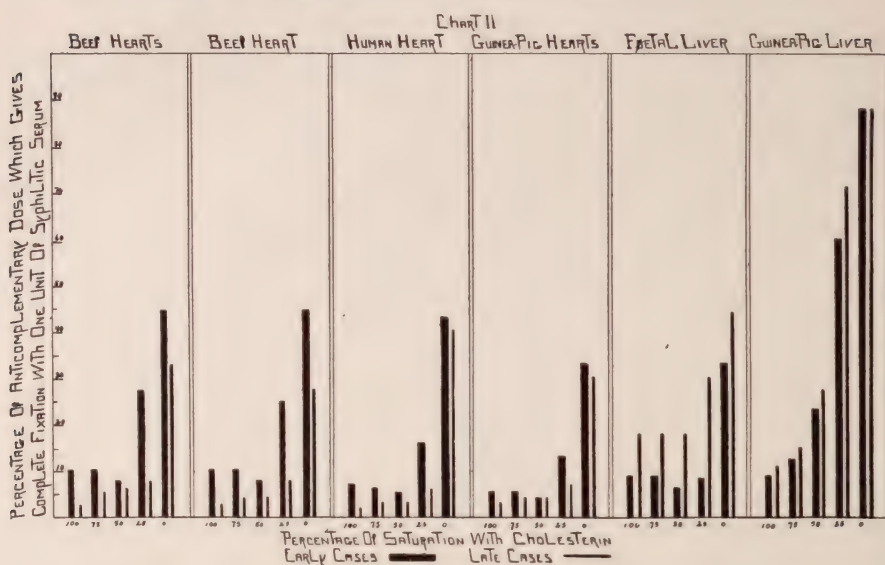
Since Walker and Swift showed that 1 to 6 emulsions of the tissue extracts were too sensitive, we made no attempt to employ preparations of this strength in our work, but used 0.1 c.cm. of a 1 to 10 emulsion which was well within the limits of safety as regards anticomplementary action.

Human heart, beef heart, guinea-pig heart, fetal liver and guinea-pig liver extracts were made by adding 1 grm. of finely chopped tissue to 10 c.cm. of U.S.P. (91 per cent.) alcohol and placing in the incubator for seven days. The extracts were shaken several times a day. They were then cooled to room temperature and filtered. Most of them subsequently developed a fine precipitate after standing for several days, which was filtered off before the cholesterin was added. To part of each extract was added an excess of C. P. cholesterin (Merck, Lehn and Fink), and after thorough shaking the preparation was placed in the incubator for twenty-four hours. After cooling to room temperature the excess of cholesterin was removed by filtration, and 75 per cent., 50 per cent., and 25 per cent. saturated solutions made by adding proper amounts of the crude alcoholic extracts to the cholesterin saturated portions. The original alcoholic extract free from cholesterin was also tested in each case.

On testing the amount of cholesterin absorbed by such extracts it was found that only about 0.3 to 0.4 of a grm. was required to produce complete saturation. Extracts made with absolute alcohol were then prepared and found to take up about 0.9 grm. per 100 c.cm. as stated by Walker and Swift. A comparison of the 50 per cent. cholesterin saturated extracts made with 91 per cent. and absolute alcohol showed that the extracts made with the absolute alcohol were much superior, so only the extracts made with absolute alcohol were used in the following experiments. The results obtained with the extracts made with the two strengths of alcohol are shown in Table II.

The anticomplementary dose of each preparation was first determined, then the amount required to give complete fixation with one unit of serum from early and late cases of syphilis. In each case the least amount of syphilitic serum giving complete fixation with our standard antigen was used as a unit, thus making the results obtained with different sera at different times comparable. The amount of each antigen required to give complete fixation with the syphilitic unit as compared to the anticomplementary dose was then determined and expressed in percentage.

These results can be graphically charted thus:—



The first division on the chart represents an antigen made by mixing two alcoholic beef-heart extracts, and it will be noted that such a mixture gave practically the same results as did the extract made from a single heart. The human heart extract was the most sensitive of all the tissue extracts, being a little better than the guinea-pig heart extracts which, moreover, showed such a tendency to become anticomplementary that we had to discard them in our subsequent work. Fetal liver preparations were satisfactory when tested against the sera of early cases, but were markedly inferior with sera from later stages of the disease. Guinea-pig liver extract was the least satisfactory of all the antigens tested.

While Walker and Swift found that the addition of cholesterol produced but little change in the anticomplementary action of their antigens, we noted a decided increase in the anticomplementary action as we increased the amount of cholesterol. The exact figures are given in Table I.

While our figures differ from those of Walker and Swift, owing to different techniques, we found, as did those investigators, that a 50 per cent. cholesterol saturated extract gave as good if not better results than the stronger emulsions in early syphilis and was almost as good as the latter against sera from late stages. In addition, emulsions of this strength were less anticomplementary and not so milky as the 75 per cent. and 100 per cent. saturated preparations. If the amount of cholesterol is still further decreased, the amount of extract required to give complete fixation shows a very marked increase.

We made and tested a number of extracts from guinea-pig hearts,

but were compelled to discard them in our later work as they all showed a tendency to develop marked anticomplementary properties in a short time, a fact also noted by Kolmer and his associates.

The superiority of the human heart extract as shown in the above chart was substantiated in our tests made with a series of bloods, giving a higher percentage of positive results with syphilitic sera than any of the antigens tested.

These extracts, using 0.1 c.cm. of a 1 to 10 dilution in normal saline, did not give any positive reactions when tested against the sera of 50 persons in whom syphilis could be excluded with a reasonable certainty though a few did give a \pm reaction. 0.1 c.cm. of a 1 to 5 dilution gave a number of positive reactions, and a like amount of a 1 to 8 emulsion gave several doubtful fixations. We, therefore, hold that with our method 0.1 c.cm. of a 1 to 10 emulsion is the best amount to use. This represents from 25 to 35 per cent. of the anticomplementary dose which is well within the limits of safety. We make up our emulsions in normal saline fresh each week and before use they are tested for anticomplementary action. Their antigenic value should also be determined from time to time.

The following table represents the results of Wassermann tests of 77 sera from patients giving a definite luetic history. Fifteen were early cases, the majority being in the active secondary stage, while a few had received more or less treatment. All, however, gave a history of infection within three years. The remaining 62 cases gave a history of infection dating back more than three years, and the majority had received more or less treatment, many being free from all clinical symptoms. The positive and negative findings therefore should not be taken as representing the usual results obtained in early and late cases. The figures, however, do show the great superiority of the cholesterol heart extracts over the other antigens used, and emphasize especially the great value of the cholesterolized human heart preparation. In addition, the figures show the superiority of absolute alcoholic extracts over those made with the weaker preparation.

Where complete fixation was obtained with 0.02 c.cm. of serum, the reaction was graded ++++. When 0.03 c.cm. was required, it was graded ++, and when fixation was obtained only with 0.04 c.cm. the strength of the reaction was estimated as +. We do not attach any diagnostic value to \pm reactions, considering such to be significant only in cases known to be or to have been recently under active treatment, and likewise consider + reactions significant only in connection with a definite luetic history, or a history of recent specific treatment.

Examining first the figures for early syphilis and counting only the strongly positive reactions (+++ and ++) we note that the

half-saturated cholesterin human-heart extract made with absolute alcohol gives 87 per cent. of such reactions. A similar extract made with 91 per cent. alcohol gave 80 per cent. of strongly positive reactions, while the best beef-heart antigen gave only 67 per cent. of reactions of corresponding strength. The Noguchi antigen shows 60 per cent. of positives, and a like percentage was obtained with the cholesterinized syphilitic liver preparations.

The great value of the cholesterinized antigens, and especially of the heart extracts, is best shown by the figures for late syphilis. In this class of cases, the Noguchi antigen gave 21 per cent. of strongly positive reactions, the cholesterin syphilitic liver 25 per cent., the best beef heart 37 per cent., and the absolute alcoholic human extract 66 per cent., practically three times as many as did the Noguchi and syphilitic liver antigens.

It will be observed that the cholesterin syphilitic liver extract was not as good as similar antigens made from beef heart, and while superior to cholesterinized normal liver, was not to be compared with human heart antigens when tested against this class of cases. The superiority of absolute alcoholic extracts over those made with a weaker preparation is also clearly shown.

As would be expected, the combined figures for early and late cases substantiate the findings for early and late cases alone. Here the figures are 70 per cent. of strongly positive reactions with the human heart antigen against 29 per cent. with the Noguchi and 31 per cent. with the syphilitic liver extract.

Antigens employed in following table:—

1. Noguchi acetone-insoluble antigen of beef heart.
2. Human heart absolute alcoholic extract 50 per cent. saturated with cholesterin.
3. Human heart 91 per cent. alcoholic extract 50 per cent. saturated with cholesterin.
4. Beef heart absolute alcoholic extract 50 per cent. saturated with cholesterin.
5. Beef heart absolute alcoholic extract 50 per cent. saturated with cholesterin.
6. Beef heart absolute alcoholic extract 50 per cent. saturated with cholesterin.
7. Syphilitic liver absolute alcoholic extract 50 per cent. saturated with cholesterin.
8. Beef heart 91 per cent. alcoholic extract 50 per cent. saturated with cholesterin.
9. Normal liver absolute alcoholic extract 50 per cent. saturated with cholesterin.
10. Beef heart absolute alcoholic extract. No cholesterin added.
11. Beef heart 91 per cent. alcoholic extract. No cholesterin added.

TABLE II.

ANTIGENS		1	2	3	4	5	6	7	8	9	10	11
Early—15 Cases	+++ {	No.	8	12	11	9	9	9	8	9	7	7
		%	53	80	73	60	60	60	53	60	47	47
	++ {	No.	1	1	1	1	0	0	1	1	0	0
		%	7	7	7	7	0	0	7	7	0	0
	+ {	No.	0	0	1	3	0	0	1	2	2	0
		%	0	0	7	20	0	0	7	13	13	0
	± {	No.	1	1	1	0	0	1	1	0	1	0
		%	7	7	7	0	0	7	7	0	7	0
	— {	No.	5	1	1	2	6	5	4	3	5	7
		%	33	7	7	13	40	33	27	20	33	47
	+++ and ++ {	No.	9	13	12	10	9	9	9	10	7	8
		%	60	87	80	67	60	60	60	67	47	53
Late—62 Cases	+++ {	No.	8	30	15	12	12	12	9	9	8	7
		%	13	48	24	19	19	19	15	15	13	11
	++ {	No.	5	11	14	11	8	8	6	5	1	1
		%	8	18	23	18	13	13	10	8	2	2
	+ {	No.	2	1	8	9	9	10	16	19	9	5
		%	3	2	13	15	15	16	26	31	15	8
	± {	No.	1	2	3	1	2	2	1	0	0	0
		%	2	3	5	2	3	3	2	0	0	0
	— {	No.	46	18	22	29	31	30	30	29	44	49
		%	74	30	35	47	50	48	48	47	71	79
	+++ and ++ {	No.	13	41	29	23	20	20	15	14	9	8
		%	21	66	47	37	32	32	25	23	15	13
Combined early and late cases	+++ and ++ {	No.	22	54	41	37	36	36	24	24	21	16
		%	29	70	51	48	47	47	31	31	27	21

CONCLUSIONS.

1. The addition of cholesterin to alcoholic tissue extracts greatly increases their sensitiveness.
2. The optimum amount of cholesterin to be added is about 0.4 grm. per 100 c.cm. of alcoholic extract.
3. This is approximately a half-saturated solution, if absolute alcohol has been used in extracting the tissue.
4. U. S. P. (91 per cent.) alcoholic tissue extract is saturated with about half the amount of cholesterin absorbed by absolute alcoholic extracts.
5. Extracts made with absolute alcohol are superior to those made with 91 per cent.
6. Cholesterinized human-heart extract makes an antigen far superior to any other obtainable.
7. Owing to their great sensitiveness, + reactions should be considered of significance only in connection with a definite luetic history; \pm reactions should be disregarded except in known treated cases of recent date.

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SOME OBSERVATIONS ON DIET IN EPILEPSY.

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Because of the fetish of medicine, too often one sedative after another is tried in a case of epilepsy, while little if any attention is given to the perverted metabolism which is always a factor. In this way the time during which something might be accomplished passes by, never to return. Every case of epilepsy requires dieting, but this dieting should not be given over to fads and the pseudo-scientific. A frank empiricism is safer than a logic based upon unsound premises.

The dietary indicated in epilepsy is simply one in which all things that tend to cause constipation and things that in the individual patient are found to be difficult of digestion are eliminated, but which provides sufficient nourishment for the individual patient. In about 50 cases which the writer studied carefully for two years, all have had constipation, nearly all have had pronounced symptoms of indigestion, and the majority have admitted that they were bolters. Nearly all those who had been treated previously had for long periods of time been upon the salt-free diet and also upon a vegetable diet, or one in which meat was reduced to a minimum. In none of these cases was there any evidence of benefit having been derived from these measures. The salt-free diet has been advised as a means of promoting the absorption of the bromides. Its justification, therefore, depends upon the desirability of saturating the patient with bromides. Now one effect of the bromides in large doses is to weaken peristalsis by the lowering of muscular tone, and it cannot be good practice to push bromide medication to that point. The salt-free diet is, therefore, not to be prescribed indiscriminately. It is not a good routine measure. The most rational explanation of its reputed beneficial effect in some cases is simply that by making food less palatable it removes the temptation to bolt and to gourmandize. The vegetarian diet has been advocated because meat contains extractives which are known to be stimulating. Indeed, epileptiform phenomena have been produced in animals by the injection of paraxanthin contaminated by a trace of ammonia. The average extractive content of meat is said to be about one-half of one per cent. But human muscle also contains extractives; and in assigning their just importance to the extractives of the meat which is eaten, we ought to weigh them against

the endogenous extractives of the body. If an individual, whose body contains 75 lb. of muscle, were to eat one pound of roast veal, the endogenous extractives would be to the extractives of this pound of veal as the decimal 0.375 to the decimal 0.0003 or as 3,750 to 3. In other words, the extractives of the pound of veal would be in quantity only $\frac{1}{1250}$ of the autogenous extractives already present in the body, and would increase the total quantity of extractives present by only that small fraction. From this it is reasonable to conclude that the importance of the extractives in meat has been exaggerated. Meat does, however, disagree with most epileptics, but chiefly for a very simple reason. Nearly all epileptics are bolters. They omit the first or voluntary process concerned in digestion which is mastication. Habit, bad teeth and feeble-mindedness are some of the causes of bolting. The writer has seen a feeble-minded epileptic child who swallowed all food whole and also buttons and other objects. This failure of the higher centres to inhibit the swallowing reflex may not account for the epilepsy in this case; but if these things were repeatedly introduced into the stomach of a normal child, convulsive seizures might ensue. The more indigestible kinds of meat are not well tolerated; nevertheless, sufficient proteid must be provided. This is necessary in order to maintain muscular tone and to provide energy for muscular work. Peristalsis is muscular work; and lack of tone in the unstriated muscle of the intestines and in the abdominal muscles will produce intestinal distention, stasis, and intoxication. To sustain nutrition is essential. When we have complete control over our patient's dietary, it is sometimes possible to provide a sufficient number of calories without including meat, but this cannot always be achieved, and it is not necessary. Malnutrition and flabby musculature are common among vegetarians, and they are conditions which we must by all means attempt to relieve. Upon the addition of properly cooked meat to the diet of those who will chew it, the writer has observed no ill effects whatever.

To instruct the patient what to eat is not sufficient. He must be told how to eat. It is necessary to be repetitious. We must be repetitious in instructing the patient because we are attempting to correct a habit which has usually been formed in early childhood. With patience and perseverance the mandate to eat slowly and chew thoroughly must be repeated many times until the patient comes to realize that it is an important matter. The teeth must be repaired and replaced when necessary, because the outcome of the case may depend upon it. Once a woman, whom the writer had treated for four months with little success, confessed that she always removed her artificial teeth, a whole upper set, before eating. A great many people regard the teeth from a purely aesthetic point of view. Of almost equal importance is the in-

junction not to hurry or exercise violently after eating. For the school boy there must be no ball game during the noon hour, unless it be before luncheon. For the child there must be no frolic with the father between supper and bedtime. An epileptic has recently volunteered the information that in an institution where he has been treated, the time allowed for eating is limited, the patients being urged by the attendants to eat faster, and he and others have often suffered a series of attacks after one of these hasty meals.

In the diet list which follows, the restriction of milk is to be noted. In his fine work upon epilepsy, Spratling says "milk is the ideal food," and Binswanger in the last edition of his book advocates the milk and vegetable diet. An observer in Germany, however, is at some disadvantage because in a country where so many are gross feeders, any restriction whatever in diet will benefit the majority of patients. Recent work upon the chemistry of epilepsy by St. Kozlowski in Poland seems to add to the evidence that milk is less harmful than other foods, but we must view the matter not in the light of chemistry alone. The preponderance of opinion is certainly in favor of milk as a chief article of diet in epilepsy, and most of the authorities consider it entirely harmless, but a number of experiences, two of which the writer will relate, have convinced him that caution should be observed in permitting it. A little girl of four was having numerous petit mal attacks. After some months of treatment, she had improved very little, and the writer could discover no error in her diet. One day while in the hospital she had five attacks, and on being questioned again about her diet, the mother said that it consisted chiefly of milk, a quart a day. The milk was eliminated, and buttermilk and a varied list more liberal in proteid prescribed. During the following eight days she had three petit mal attacks and then for two months none at all. No change in the treatment except the elimination of milk had been made. She still has some petit mal attacks, but on the whole has steadily improved. Another little girl of seven, while upon the usual routine treatment with bromides, continued to grow worse. She was on the milk and vegetable diet, drinking a quart of milk daily. Malnutrition was marked. The mother was given a diet list and told to reduce the amount of milk. Two weeks later she reported no day attacks, but usually three or four nocturnal attacks, a very great improvement. The dose of bromide was then increased from 5 gr. to 9 gr. three times a day, and two weeks afterward she reported no day attacks and usually one nocturnal attack. Further inquiry then disclosed that she was eating no meat except a little chicken and that she was eating uncooked peaches and grapes. All milk and all uncooked fruit were then forbidden, and permission was given to eat some meat, provided that she would chew it. She then remained absolutely free from attacks for two months and

her general condition became much better. She was then taking sodii bromidi 5 gr. in tinctura ferri chloridi 1 dram three times a day. Unfortunately, while visiting in the country, she lost all that she had gained. Brominism followed a larger dose of sodium bromide. One of the blotches became infected, necessitating long confinement, and she is now worse than at any time before. This case illustrates what may happen to an epileptic child while in the country. A few weeks in a place where there were plenty of pie, doughnuts, fresh bread, biscuit, and milk on the table and where berry picking was the principal diversion have probably ruined the prospect of recovery which this child appeared to have. In those cases in which milk has appeared to be harmful, the writer has supposed it to be because of the clotting of milk in the stomach, and he has permitted it when taken upon a cereal or as bread and milk.

A good diet list in epilepsy is the following:—

	Permitted	Not Permitted
Toast	Meat, only if you chew it	Fresh Bread
Zwieback	thoroughly, as fol-	Fresh Biscuit
Milk Toast	lows:—	Doughnuts
Graham Crackers	Chicken, roasted	Pie Crust
Oatmeal Crackers	Chicken, stewed	Griddle Cakes
Agar Biscuit	Lamb Chops, broiled	Beans
Boston Brown Bread	Beef, roasted	Cheese
Graham Bread	Mutton, roasted	Salads
Cream of Wheat	Beefsteak, broiled	Cabbage
Wheat Germ	Fish, boiled	Pickles
Farina	Bacon	Cucumbers
Grape Nuts	Buttermilk	Raw Tomatoes
Rice	Cooked fruit	Fried Potatoes
Hominy	Milk, not to be taken	Cold Potatoes
Potato, baked	alone, but on cereal or	Melons
Potato, mashed	as bread and milk	Berries
Potato, stewed		Grapes
Macaroni	Very little, if any, of the	
String Beans	following:—	Uncooked Fruit, except
Spinach	Tea	oranges, figs and dates
Summer Squash	Coffee	
Eggs, soft boiled	Cake	Alcoholic Drinks
Eggs, dropped	Candy	
Butter	White Bread	Pepper, mustard and
Cream		and other condiments

NOTE.—Eat regular meals. Eat slowly and chew thoroughly. Never eat too much. Never hurry after eating. Drink plenty of water. Drink a tumbler full of water at bedtime. Never eat for pleasure.

Saline cathartics are much abused in epilepsy. With diet, specific exercises for the abdominal muscles and abdominal massage, the milder laxatives such as cascara sagrada are sufficient. To

prescribe the salines in any but acute conditions is to abuse them. They cause overdistention of the colon and cecum with possible impairment of the ileocecal valve. Enfeeblement of peristalsis invariably follows this repeated stretching of the intestinal walls, and perhaps the secreting cells of the mucosa are injured by the excessive withdrawal of fluid from them. We should distinguish between the salines which act by abstracting water from the tissues and the bitter drugs like cascara which do stimulate secretion. The former are habit-forming, while the latter are often curative because by stimulating cell activity they stimulate cell growth. The sinusoidal electrical current applied to the colon works well in some cases of epilepsy, but appears to induce seizures in others. The production of antiperistalsis with regurgitation into the ileum may account for its ill effect in these cases.

INDUCED PNEUMOTHORAX.
(INDICATIONS AND CONTRAINDICATIONS)

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Society, Edgewater, Colo.

In spite of all advances of modern phthisiotherapy there have remained large numbers of consumptives for whom our efforts have heretofore proved futile. Especially is this true of the advanced and rapidly progressive types of cases.

In induced pneumothorax we now have a form of treatment which has proved of the greatest value and has produced most brilliant results, especially in that large class of cases considered absolutely hopeless under the older modes of treatment.

Those of us who have followed the literature on the subject can no longer remain in doubt as to the value of induced pneumothorax in selected cases and in certain forms of tuberculosis.

Jessen¹ says that artificial pneumothorax is possibly the greatest advance of medicine in the past ten years. Saugman² states that the pneumothorax therapy constitutes a real advance in the treatment of pulmonary tuberculosis, which makes it possible to effect a cure in many cases in which we stood helpless heretofore. Molin³ writes that artificial pneumothorax is undoubtedly the best treatment of pulmonary tuberculosis at the present time and if applied at the right time produces wonderful results. Bresciani,⁴ in a preliminary report of cases, says that it would be impossible to obtain similar rapid and marked improvement by any other mode of treatment. Burnaud,⁵ in a report of the immediate extremely favorable results in 28 cases, states that he cannot say what they will show in the future, but it is certain that without pneumothorax these cases would have been either dead or in a cachectic state. Pearson,⁶ in a report of 17 cases, says that very few of these would have been alive but for the operation, yet all are alive and several enjoying good health.

A study of case reports illustrates conclusively the remarkable results obtained by this treatment. One need go no further than to study those of Forlanini,⁷ Brauer and Spengler,⁸ Saugman, of Robinson, and of Floyd. It is true that unfavorable results are reported, but one should not, on that account, condemn the whole pneumothorax therapy, particularly since it is certain that a large proportion of such results may be ascribed to a choice of unsuitable cases and to faulty technique. It should also be recognized

that results in pneumothorax therapy cannot be obtained in a short time. The treatment must be carried on for periods varying from at least six months in light cases to one and one-half years, and even longer, in severe cases. Zink,⁹ in a report of 110 cases, says that if we wish to achieve lasting results we should require that the pneumothorax be kept up for at least from two to two and one-half years.

Although artificial pneumothorax can no longer be said to be in an experimental stage, there are, however, certain features upon which opinions vary considerably. The writer refers here particularly to the indications and contraindications. It is unquestionably of the greatest importance to gain, if possible, a clear conception as to the cases which are suitable for this treatment, first, so that we may not deprive a large number of otherwise hopeless cases of its possible benefits and, secondly, in order that we may not bring artificial pneumothorax into disrepute by undertaking it in cases unsuitable and doomed beforehand to unfavorable results. In order to throw some light on this disputed point, the writer presents some conclusions from personal observations, extending for a period of one year, in the treatment of 30 cases.

The general impression prevails to a great extent, especially among men not engaged in this particular branch of phthisiotherapy, that artificial pneumothorax is indicated in practically only one class of cases—namely, with severe disease of one lung and with absence of disease in the other lung, *i. e.*, in so-called unilateral cases. This impression, however, must be completely discarded, since, as has been conclusively shown by roentgenology and pathological anatomy, unilateral cases of tuberculosis practically do not exist except in the very earliest stages, and certainly not when the disease on one side is advanced, of a severe and destructive type, and of long duration. And yet we find that many authorities on pneumothorax therapy give, as the essential and only permissible indication, ‘unilateral disease.’ It is an indication, but no more than an ideal one, and were it strictly adhered to, artificial pneumothorax could be applied in a very small number of cases and would become one of the rarest operations. As a matter of fact, the physical and *x*-ray findings in cases reported by clinicians, who give strictly unilateral disease as the essential indication, show that in all cases there existed more or less involvement of the other lung.

Leaving out of consideration, therefore, that *rara avis*, a strictly unilateral involvement, the question resolves itself into determining (1) the nature and extent of involvement which would serve as an indication for artificial pneumothorax, and (2) in conjunction, the nature and extent of involvement of the other lung that is permissible.

In regard to initial and early cases, the preponderance of opinion is against artificial pneumothorax, particularly until all other means of treatment have failed. The principal objections are based upon the pathology of lung compression. Thus Kohlhaas¹⁰ would exclude initial cases on account of fibrous changes occurring in the healthy lung tissue and thickening of the pleura in long standing compression. According to experimental studies by Schur and Plaschke,¹¹ the development of tuberculosis and its respiratory extension may be assumed not to be influenced by compression and immobilization of the lung. They claim that it is the fibrous changes in the lung tissue which lessen the disposition of the lung to infection and spread of disease; and as they conclude that fibrous changes occur late in artificial pneumothorax, and are irreparable, the treatment is not indicated in early cases and in those of slight severity. Sorgo¹² gives, as his reasons for the unsuitability of such cases, (1) the possibility of extension of disease in the other lung, (2) exudates which, by compression, may cause loss of function of the lung, and (3) the occurrence of fibrous changes in healthy lung tissue. Forlanini, however, after an experience extending over twenty years, who formerly advised artificial pneumothorax only in severe advanced cases, now operates on less advanced lesions, claiming that the healthy lung tissue does re-expand and functionate even after long-continued compression. Dumarest¹³ advises pneumothorax even at the beginning of the disease, even when the lesions are still circumscribed. Can we, he asks, foretell the course, and have we in phthisiotherapy so many remedies that we can ignore one which has actually proved its worth? Brauer would apply the treatment in all cases in which the dietetic-hygienic and specific treatment has become hopeless. E. Maragliano¹⁴ advises artificial pneumothorax in all cases in which there are positive signs and symptoms of a tuberculous lesion.

At a recent meeting of the Chicago Medical Society, Dr. John B. Murphy¹⁵ said: "In the local management of tuberculosis of the lung, artificial pneumothorax is now the dominant treatment all over the world, because it places the diseased lung at rest. When shall we use this treatment? I was shocked a short time ago, in looking over the literature on pneumothorax as a treatment for pulmonary tuberculosis, to read that some of the ablest men suggested it as a treatment for tuberculosis when it had not yielded to other means. The old appendicitis proposition all over again. Why must we wait until there are cavities in the lung? Why must we wait until there are hemorrhages? Why must we wait until a whole lobe of a lung is involved? Use it now! Pneumothorax is a mechanical aid to nature in the process of cicatrization and encapsulation of a tuberculous focus in the pulmonary tissue."

In determining the advisability of artificial pneumothorax in

early cases and of slight severity, the economic side of the disease is taken into account by several writers on the subject. The pneumothorax therapy, it is claimed, does not require so much sacrifice of earning capacity and family life as does sanatorium and climatic treatment. Zink says that particularly in the working classes should artificial pneumothorax be applied as far as possible, since, in spite of all efforts, the results in somewhat advanced disease are, in general, limited with the hygienic-dietetic treatment.

Taking, however, all factors into consideration, it may be said that artificial pneumothorax should not be undertaken in initial and early cases of slight severity, at least not until the other methods of modern phthisiotherapy have been given a fair trial.

We find that more or less extensive and particularly severe disease of one lung is a universally recognized indication for pneumothorax therapy, provided there be no contraindication on account of too much involvement of the other lung or disease of other organs.

It is not definitely agreed upon how much involvement of the other lung is permissible. As a general rule we find that slight and comparatively inactive disease, or 'markedly less extensive disease,' or 'infiltration of apex' of the other lung is not considered a contraindication. These terms, however, are very indefinite and depend too much upon the personal equation. In an extensive study of the literature, the writer finds only one instance where this has been expressed in definite terms. Von Jagie,¹⁶ of Vienna, states that disease of slight severity of the other side, not extending over more than one lobe, is permissible. Extensive and rapid progression, even after temporary improvement, has been observed on the less affected side in the course of pneumothorax therapy. It is not, however, much more frequent in cases with more extensive disease than with an amount of involvement just mentioned. It is also not definitely shown that it is directly the result of compression of the other lung unless this is accomplished too rapidly and by using large amounts of gas.

The consensus of opinion appears to be that disease of the uncollapsed lung, if not very extensive, is favorably influenced. Forlanini, who may be justly considered the father of pneumothorax therapy, said, in 1909, that induced pneumothorax is indicated even in bilateral cases which present severe one-sided symptoms, success depending upon the intensity of the disease on the less affected side. In 1910, basing his opinion upon 89 cases, he states that he is convinced that disease of the other side does not contraindicate pneumothorax, that it is favorably influenced, and that in bilateral cases the treatment can be applied first on the more diseased and then on the other side. In 1912 he reiterates his observations on the favorable influence of the collapse upon the disease on the less affected

side. Vittorio Maragliano¹⁷ has shown by radiographs, taken a year apart, calcification of lesions on the uncollapsed side in 2 cases. Ascoli,¹⁸ basing his opinion on 30 cases, says that, in general, disease of the other side, if not extensive, is favorably influenced. Zubiani,¹⁹ from 48 cases treated, observed that light affections of the other side are favorably influenced.

As to the form of involvement, Maragliano states that sclerosis or peribronchitis, or old calcified lesions not excluding cavities, and disseminated and unimportant lesions in which healing processes are apparent, in the other lung, are not contraindications for artificial pneumothorax; and Piery claims that nonulcerative, purely bronchitic changes in the less affected lung may, perhaps, be disregarded.

It appears to the writer that no absolutely definite rules can be laid down as to the amount of involvement of the less affected side permissible. Every case should be judged individually on its clinical and pathological features. In the writer's cases, at the Sanatorium of the Jewish Consumptives' Relief Society, practically all showed more or less extensive involvement of the less affected side. After one year's observation of a considerable number of such cases, he finds that only in one case has there occurred an extension of the disease or an increase in the activity of the uncollapsed lung. The exception is a patient who developed a tuberculous pneumonia of the uncollapsed lung, which resulted fatally. In several cases a marked improvement could be noted, as evidenced by disappearance of all active signs of disease.

As has been stated, more or less extensive and particularly severe disease is considered an absolute indication for artificial pneumothorax. As to the disease of the lung which it is desired to collapse, the choice of cases should not depend so much on the extent of the disease as on the character of the process and the clinical features. While formerly only the most severe and hopeless cases were considered suitable for pneumothorax therapy, the tendency to-day is not to wait until the cases have become desperate and have reached their most severe and last stages.

Some clinicians would exclude as unsuitable for compression certain forms of involvement. Thus, Weiss²⁰ considers pneumonic phthisis a contraindication, and Volhard²¹ thinks pneumothorax questionable in caseous pneumonia and not suitable in galloping disseminated tuberculosis. Disease of the lower lobe is considered as unsuitable for compression.

Of tuberculous complications, severe and long-continued hemoptysis is, at the present time, most successfully treated by artificial pneumothorax.

Artificial pneumothorax as a therapeutic measure may be produced with two objects in view, (1) primarily as a curative measure,

and (2) primarily for the relief of severe symptoms or as a palliative measure. In the first instance, it is logical to suppose that the slighter and less extensive the disease on the less affected side, the more favorable the prospects for good and lasting results. In the second instance, every good result is a clear gain. The effect of compression of a lung upon certain symptoms, unyielding to other modes of treatment, is frequently marvelous and embraces the disappearance of hectic fever, of night sweats, and of severe and harassing cough. There is usually a marked diminution in the quantity of expectoration, although it may at first be increased. Even in cases with considerable involvement of the other lung the lessening of the absorption of toxins from the active lung, as evidenced by improvement in these symptoms and as a consequence in the general condition, frequently produces most unexpected results in long continued and even lasting recovery.

As stated above, we should not wait until the disease has assumed its most hopeless stages. But if we have to deal with an otherwise hopeless, progressive case, it is perfectly justifiable to compress the more diseased lung, particularly if it is thought to be giving rise to the symptoms which sap the vitality of the patient. Unfortunately, it is most frequently impossible to produce an artificial pneumothorax in these far advanced cases on account of extensive adhesions or entire obliteration of the pleura, another argument for not waiting until the last stages of the disease have been reached. It is said that artificial pneumothorax is indicated only in a very few cases of pulmonary tuberculosis. This is true to a certain extent, but may be attributed to the circumscribed and narrow indications laid down by some writers. These indications should be made more elastic provided the carrying out of the treatment is in the hands of one who is thoroughly versed in all the features of pneumothorax therapy. In the hands of the inexperienced, only the most favorable cases and those with the minimum of involvement of the less diseased side are safe from disastrous results. It should also be emphasized that this treatment, especially at the beginning, is better applied under institutional supervision.

Attempt at collapse often fails on account of pleural adhesions, but in many cases even a partial pneumothorax frequently produces favorable results.

Pleural adhesions, particularly if extensive, are mentioned as an absolute contraindication to artificial pneumothorax. In the writer's opinion the question of adhesions should not be considered under indications but under complications. It is fairly well established that neither by physical nor by roentgenological examination is it possible to tell beforehand either the nature or extent of adhesions, nor to what degree they can be loosened by the injection of gas. The writer has several cases in which, by careful insufflation of gas in

small quantities continued over a long period of time, he has succeeded in loosening adhesions which at first seemed hopeless. In regard to disease of other organs, tuberculosis of the larynx has long stood as an absolute contraindication. But in this, as in other features, a number of authorities have modified their opinions. Thus Forlanini no longer considers it an absolute contraindication, claiming that he has observed improvement, and even cure, under artificial pneumothorax. Du Gradi²² reports 3 cases which go to show that complicating laryngeal tuberculosis of severe nature may become arrested, and even cured, under pneumothorax therapy if a clinical cure of the lung process is obtained. Von Jagie does not consider laryngeal tuberculosis as a contraindication. From personal observation, in at least one case, the writer might say that there has been marked improvement in the laryngeal condition.

Intestinal tuberculosis is an absolute contraindication. It must, however, be kept in mind that not all severe diarrheas occurring in the course of tuberculosis are tuberculous. They are frequently the expression of a severe toxemia, and are favorably influenced by compression, which stops the absorption of toxins.

Among other contraindications may be mentioned chronic organic heart disease, kidney affections (albuminuria without other signs of nephritis is not a contraindication), amyloid disease, and pregnancy. Diabetes is not an absolute contraindication. In conclusion the writer presents a summary of the indications which he has used as a guide in the selection of his cases. These may be divided into (1) absolute indications and (2) permissible indications.

I. ABSOLUTE INDICATIONS.

1. Moderately and far-advanced, severe disease of one lung with slight or moderate disease of the other side, which does not extend over more than one-third of the lung, and without active cavities. In such cases the compression should be effected slowly and the uncollapsed side be carefully watched for increased activity.

2. Moderately and far-advanced disease of one side of slight or moderate severity with disease on the other side as described under 1, especially in cases in which a fair trial has been given to the usual modes of treatment.

3. Severe and particularly long-continued hemoptysis, irrespective of disease on the other side, provided it can be definitely determined where the bleeding comes from. In cases in which there is no contraindication in the extent of the disease of the other lung, the compression should be kept up. In cases with too extensive disease of the other lung, the lung should be permitted to re-expand after sufficient collapse has been produced to control the hemoptysis.

II. PERMISSIBLE INDICATIONS.

1. Severe and extensive disease of one side, with disease on the other side more extensive than described under "Absolute Indications," in cases with general symptoms of toxemia which may be definitely ascribed to one lung.

2. Initial cases, particularly those with severe symptoms not showing signs of improvement or arrest under hygienic-dietetic and specific treatment after a reasonable length of time—not exceeding six months.

3. In all classes of cases under absolute indications with laryngeal tuberculosis of slight or moderate severity and nonulcerative.

The dangers and complications of pneumothorax therapy should not be considered as contraindications to the application of the treatment.

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PAST AND PRESENT VIEWS UPON THE TREATMENT OF PUERPERAL SEPSIS.

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It is sometimes wise to pause for a moment in the daily work of applying the recognized treatment of our day in the cure and relief of disease, and to compare such treatment and methods with that of our predecessors of not so long ago. We are thus better able to get our bearings, and to place, by such comparison, the true value upon present-day views. There are but few conditions upon which the last word has been said in regard to treatment, and we must realize that some day our own methods will be compared with the views and truths of years to come, and that pet theories of ours to-day will be ridiculed tomorrow. The only consolation in such thought is the fact that our own time is a step toward the accomplishment of better things.

It is extremely interesting to compare our own views upon the treatment of puerperal sepsis with those in vogue at the beginning of the nineteenth century. In reading the authors, who wrote upon obstetrics one hundred years ago, one is struck with the skill with which they avoided the subject of 'Childbed Fever.' Taking into account the fact that they were absolutely ignorant of every phase of the subject, it is not so surprising. Naturally, what treatment was advocated was based either upon false notions of the etiology or upon empiricism. A number of authors, writing in the early years of 1800, discussed puerperal infection, presenting their own and also clearly reflecting the views of their time upon the etiology and treatment of this condition. These treatises are of considerable interest inasmuch as they are based upon the experience of the writers in various epidemics of puerperal fever occurring in their practice. There were three men who stood out prominently at this period, each of whom had his own convictions in regard to treatment. These were Gordon, of Aberdeen, Armstrong and Lee of England. Gordon's treatise is based upon 77 carefully recorded cases. The report of these cases is a tragedy from beginning to end. In their perusal we can imagine the helplessness of this physician in his struggle with a condition which he did not in the least understand. The writings of Armstrong and Lee also contain numerous

case reports detailing both fatal cases and the recoveries. Armstrong, after reciting a number of cases with their treatment, in true appreciation of his helplessness, remarks, "Nothing is more painful to my feelings than the review of unfortunate cases, for I generally imagine that something might have been omitted or added for the better treatment." Their ignorance of the etiology claimed a high death toll. Gordon at every opportunity performed autopsies on his cases. One of these examinations was upon the body of a woman who had died of a most virulent infection. Two days later, he attended in labor a lady whom he designated as 'Mrs. Blank,' evidently a person of distinction and social position. He prefaces the report of this case with these words: "This lady thought herself secure because she was to be delivered by me, and I shall ever regret that her expectations were disappointed." He then describes a simple normal labor. Twenty-four hours later the chill appeared followed by the usual symptoms of a virulent septicemia. On the fourth day the woman died, and he closes the report with these words: "Accordingly the remainder of life was one continual conflict, painful to the patient and distressing to the spectators, until finally death closed the melancholy scene." There are volumes written between those lines. We can feel the anguish in the heart of this man at the unfortunate termination of this case, and in the light of our knowledge to-day, we know that he was responsible for her death.

The treatment of childbed fever at this time brought forth much acrimonious discussion. It was common for one physician to charge a fatal termination to the physician in charge if it happened that they differed in their views upon treatment. The profession was divided on treatment between two great principles, bleeding and purging. Some of the more uncertain of the profession followed both teachings, and no doubt their patients died more promptly.

Gordon was the great exponent of bleeding; few of his contemporaries had the temerity to bleed as he did. He went so far as to say, that by this means he cured every case if seen at the onset. His practice was to abstract 20 or 30 oz. of blood as soon as the evidence of trouble appeared. The patient was frequently bled until she fainted, irrespective of the amount. In twelve hours she was bled again unless she showed decided improvement. This was not infrequently repeated upon the third and fourth days, from 10 to 20 oz. being taken each time. 60 to 80 oz. of blood were often taken during a period of three or four days. When these patients recovered, it was attributed to the treatment.

Armstrong believed in purging. Calomel, castor-oil, Epsom salts and jalap were used in most liberal dosage. The amount of calomel sometimes used was astounding. It was not uncommon to give

from one-half to one ounce within three or four days. Meigs, in his book on puerperal fever, mentions one case that received 520 gr. Perhaps, an idea of this treatment may best be obtained by citing briefly one of Armstrong's cases. A strong, robust Irish girl was seized with a chill the day following her labor. 10 gr. calomel were promptly administered. This was followed by 4 oz. Epsom salts. The evening of the same day 30 gr. calomel were given in mucilage of acacia, the dose to be repeated every hour. It does not state how many doses were taken. The day following, 10 gr. more calomel and 3 oz. castor-oil. Next day four tablespoonfuls castor-oil every two hours. She would probably have received more calomel, but in the meantime she died. Other cases with even more vigorous treatment were described. There were some men of that day who spoke highly of the value of emetics, and ipecac and antimony were often used freely for the purpose. Still others found benefit in the use of poultices and blisters, and the abdomen of the patient was alternately blistered and poulticed. Surely in many cases, death must have been a blessed relief. None of the authors, writing at that time, made any mention of local measures directed to the vagina or uterus.

The foregoing constituted the treatment until about 1850, when the writings of Holmes and the demonstration of Semmelweis introduced a new feature in the treatment of puerperal infection—its prophylaxis. In many quarters the profession were slow to accept the teaching of these men, and it was not until the germ theory became generally recognized by the work of Pasteur and others that prophylaxis was assured a place beyond dispute. The early efforts at prophylaxis were necessarily crude, and it was only after a closer study of the bacteria that it could be brought to its present perfection. After the general acceptance of the bacterial cause, all treatment was formulated with the definite purpose of eliminating the germs or their toxins. Bacteriology demonstrated that no single germ was responsible for these infections, but that the clinical variations seen are due to the possible variety of the infecting bacteria and the various possibilities of the tissues invaded. It was further demonstrated that the streptococcus is most often the germ at fault, and that the endometrium is the most frequent focal point for infection. It was natural, therefore, that the uterus should have been the seat of attack. The curette was first turned to as a means of eliminating the morbid material. Then came the antiseptic douche, vaginal and uterine. The bacteria in the blood next occupied attention, and an effort to attack them here called forth the serum treatment, antiseptics introduced into the blood, and finally the vaccines. Clinical experience and a broadening knowledge of bacteria have made it possible to give each of these principles its proper value in the treatment of sepsis.

The Curette.—In the early days of bacterial knowledge, the curette was freely used. The septic uterus was scraped, as a routine, once and perhaps several times. This plan of treatment brought disappointment to the surgeon, and without doubt in many cases death to the patient. After Bumm demonstrated the round-celled infiltration by which Nature attempts to limit further invasion, we understood why the curette was dangerous. The use of the curette to-day is very limited in any form of infection, its only possible excuse being certain evidence of the retention of clots and secundines. In this case only a blunt curette should be used, and when the finger can be substituted even the blunt curette should not be used. These views are now so generally accepted by the profession that the curette is no longer even discussed as a means of treatment in puerperal infection.

Intra-uterine Treatment.—The intra-uterine douche still enjoys much favor as a means of treatment in infections, and it will still be some time before it is relinquished by the general profession. If it be borne in mind, however, that within a few hours after the introduction of the bacteria into the uterus, they have passed into the tissues, long before symptoms supervene, it will be understood how hopeless is the effort to influence the trend of affairs by washing out the uterus. All kinds of antiseptics and germicides have enjoyed, at one time or another, more or less favor as agents in the uterine douche. Not only, however, does clinical evidence indicate that such douches are of little value, but there are those that maintain that they are distinctly harmful. The writer's experience has certainly shown that douches of normal salt solution will accomplish as much as the medicated douche does in putrefactive conditions within the uterus and in colon bacillus endometritis. In the latter instance, the profuse, purulent and offensive discharge which is present can often be lessened to a considerable degree by their use. Tincture of iodine has been frequently used in swabbing out the uterine cavity, but in the true streptococcus infections it is probably useless. The intra-uterine douche is slowly but surely going the way of the curette, and we are forced to admit that there is no local treatment productive of definite results.

Attack of Bacteria in the Blood.—The demonstration of the streptococci and their toxins in the blood brought forth a new principle in treatment. Marmorek was the first to prepare a serum for use in these infections. His published reports seem to indicate that it would be a valuable aid in treatment. Others, however, did not meet with his success, and at the present time it is conceded that it has no definite or certain action in these infections. Our broadening knowledge of germ life points to a possible reason for the failure of the serum. It is now well known that streptococci, morphologically the same, show the widest possible variation in their virulence,

and this has prompted the manufacture of a polyvalent serum from various strains of streptococci. This serum has apparently been of no greater value, but if a serum is used, the polyvalent is the more rational.

With the knowledge of the bacteria in the blood, it was only natural that an effort should be made to limit their growth or destroy them by antiseptics. Unfortunately, however, any of the germicides known to-day, introduced into the blood in strength to kill the bacteria, will also kill the cells with which they come in contact. Carbolic acid was one of the drugs used for this purpose, very weak solutions being injected subcutaneously. One never hears of this treatment now. In the past few years, formalin in very low percentage has been used intravenously, about 500 c.cm. being introduced into the vein at frequent intervals. There is no evidence that such a solution acts any better than normal salt solution used in the same way. Fluid thrown into the circulation would seem both theoretically and practically to have a place in the treatment of these infections. With kidneys and skin functioning properly, many of the toxins are, no doubt, more easily eliminated by its use. The use of salt solution is, however, usually delayed until the patient is beyond all help. After kidneys and heart are damaged beyond a certain point, a bit more or less of the toxin is not going to influence the situation.

Among the agents used for the attack of the bacteria in the tissues, the colloid form of silver, collargol, introduced by Credé, of Dresden, still enjoys a considerable reputation. Its use at times seems to be of value, clinically. The most frequent form for its use is the 15 per cent. ointment, a dram of which is used by inunction every three or four hours. Following its use, it is not uncommon to see a decided fall in temperature. It is often employed without a proper understanding of how it should be applied. Cases are frequently brought into the hospital with the ointment smeared over the abdomen. Such an application is practically useless. It should be used by inunction at the same sites which are used for mercury. The skin should be gently but thoroughly scrubbed with soap and water. It will usually require from fifteen to twenty minutes for the disappearance of the ointment into the skin. The area may then be covered by a piece of oiled silk. A solution of the silver itself may be used intravenously in some cases. The writer's experience with the silver inclines him to the opinion that it does possess some value in the treatment of these conditions.

Vaccines.—When the serum treatment failed us we lost heart for the time being, but took new hope when vaccine therapy was put forth. Here again we have been doomed to disappointment. Thus far there is no proof that vaccines have any value in acute streptococcus infections. Even had they proved of value, the time re-

quired to prepare an autogenous vaccine would in many cases be a fatal drawback to their use. In the colon infections of the chronic type an autogenous vaccine has, in a number of the writer's cases, been of distinct benefit, and in such cases it should be employed.

Surgical Treatment.—In recent years considerable has been done along the lines of operative treatment. In localized collections of pus the indication and need of surgery is obvious. Removal of the uterus has been done a number of times with recovery in some instances, but whether because of or in spite of the operation is a question. In certain rare cases of suppurative metritis the indication for hysterectomy is clear. Drainage of the peritoneal cavity in peritonitis is a rational procedure, and should be employed as soon as unmistakable evidence of fluid is present. Drainage can easily be accomplished under local anesthesia. In three late cases, so drained by the writer, all died. In cases in which the peritonitis is merely a local expression of a virulent septicemia, the reason for failure is obvious. Perhaps the most promising results of surgery have been obtained in the ligation of the pelvic veins in thrombophlebitis. A number of successful cases have been reported, and, doubtless, more experience will define better the indications and evolve the details in the technique.

The foregoing is a brief résumé of the more common remedial measures employed to-day in puerperal sepsis. Unfortunately, however, if we are honest with ourselves, we are compelled to admit that we are just as helpless, so far as specific treatment is concerned, as our friends in the days of bleeding and purging. In the face of the more severe septicemias, we are powerless. The hopelessness of such cases is frequently seen in hospital wards to which these patients often find their way. Such experiences clearly indicate that whatever is done for these cases must be done early, in the hope that well-directed effort will limit the infection to a local condition. The writer has often been impressed that many an infection has developed and spread because of the cowardice of the physician to believe that the temperature and early symptoms in his case were due to infection. Every possible and impossible cause is ascribed until the evidence is too clear to be ignored, and then the patient may have passed the dead-line.

In estimating the value of any treatment, it must not be forgotten that sometimes apparently hopeless cases of streptococcus infection recover. In many a case that has so recovered, the successful outcome has often been attributed entirely to the treatment employed. In this connection, it is interesting to note that in 100 cases that Merman treated by placebo, the results were just as good as in another hundred in which he adopted a rational treatment. While we are compelled to admit that in the treatment of developed cases we are not more certain of our results than were our predecessors

seventy-five years ago, we may feel that we have reached a high level in prophylaxis. So far is this true, that it may be said that every case of sepsis, excepting rare instances, is preventable and its occurrence is attributable either to carelessness or ignorance. Accepting this statement as true, it would seem that the profession and the state still have a duty to perform. The profession and authorities of county, state and city have enacted laws and provided means for safeguarding the health of the people. The milk for the babies is watched from the cow into a proper nursing bottle; our foods are inspected by an elaborate and expensive system; we have a bacteriologist to tell us to boil the water; the laws provide that none shall practise medicine or surgery except those who have met the requirements and are properly qualified; the sale of patent medicines and dangerous drugs is restricted and supervised; and yet with all these refinements in the effort to preserve life and health, the midwife has been almost completely overlooked. In this city alone there are registered 118 midwives who probably attend from one-third to one-fourth of all the labor cases. The only requirement imposed upon these women is an examination held by a board, and they are then given free license to engage without restriction in the practice of a department of medicine requiring for its safe conduct as perfect a surgical technique and skill as surgery itself. What is the result? A certain number of women lose their lives each year, and the number of women whose health is ruined or who are left with permanently diseased pelvic organs can only be surmised. Physicians who see much of midwife practice are best qualified to tell us. In the Gynecological Ward of the General Hospital, fully three-fourths of the puerperal patients received are women who have been attended by midwives. At one time during the past year, the writer had under his care in the ward 3 cases of infection. Two of the women were delivered by the same midwife within a few days of each other. They both died promptly of a virulent septicemia. The third was delivered by another midwife, and after a long precarious illness, this one recovered. Does this not sound like a reversion to the days of our ignorance?

It has often been argued that the midwife is necessary and useful. She is neither, and her existence in this enlightened age and country of ours is a crime.

THE PRESENT STATUS OF THE TREATMENT OF ADVANCED CARDIAC DECOMPENSATION.

By ALBERT E. TAUSSIG, M. D., of St. Louis.

The treatment of cardiac decompensation, as a whole, is far too extensive a subject to be treated adequately in a limited number of pages. The writer will not even attempt to cover exhaustively the treatment of advanced decompensation but merely to discuss the two or three procedures which offer to his mind the best prospects of success in the treatment of this condition and the value of which is not as yet universally recognized by the medical profession.

Rest.—No method of treating a seriously impaired circulation can succeed unless the patient has sufficient rest. This does not mean merely keeping him in bed, indispensable as this is. He must be protected from all worry and excitement, and above all he must have a sufficient amount of sleep. These patients are, however, nearly always poor sleepers, even when they are not kept awake by definite discomfort, so that sleep must usually be induced artificially. The milder hydrotherapeutic measures, such as the partial or complete wet pack, rarely suffice, so that usually we must have recourse to drugs. Veronal, in 5-10 gr. doses, or adalin, 15-20 gr., often produce refreshing sleep, and paraldehyde, in doses up to half an ounce, is sometimes successful when all other soporifics fail; but not infrequently nothing will avail but morphine which, when necessary, must be given freely. A sufficient amount to produce sleep, varying from $\frac{1}{12}$ to $\frac{1}{4}$ gr., rarely as much as $\frac{1}{2}$ gr., may be given hyperdermically at bedtime. A single adequate dose will usually act more satisfactorily than two smaller doses, even when the latter in the aggregate amount to more.

Another method of giving morphine in these cases, which the writer learnt from the late Dr. W. E. Fischel, and which, both in his hands and in the writer's, has been productive of most satisfactory results, consists in the administration by mouth of minimal doses at short intervals. Thus $\frac{1}{24}$ gr. may be given every three hours, either with or without digitalis, producing not only a sensation of well-being during the day but also quiet sleep at night. Occasionally, in patients with a violent idiosyncrasy against digitalis, morphine alone thus given will act as a most efficient heart tonic.

Diet.—Mental and physical rest is not, however, the only kind of rest required; the digestive tract must be taxed as little as possible. This is, of course, a commonplace, and no one, probably,

attempts to treat grave cardiac decompensation without restricting the diet. This restriction is not, however, always carried out on a rational basis. The three indications in the dietetics of advanced decompensation are an easily digestible food and a rigid restriction both of the salt and the water intake. These indications are met in an almost ideal fashion by the modified Karell regimen. Karell was a Russian physician who, in 1866, advocated an exclusive diet of skimmed milk for a variety of affections. During the first week he ordered from 60-200 c.cm. three to four times daily; nothing else. During the second and following weeks larger quantities of skimmed milk (up to 1,500 c.cm. daily) were allowed and this dietary persisted in for some time. The suggestion did not, however, attract much attention until it was revived in 1908 by Jacob in Lenhartz's clinic. Since then, in a more or less modified form, it has met with increasing favor, particularly in advanced cardiac impairment and especially in the presence of extensive edema or hydrops. A useful modification is the following. The patient receives from 800-1,000 c.cm. of milk daily, in small amounts at rather frequent intervals. For five days he takes nothing else, not even water. The patients usually do not complain of hunger but often of thirst. If the latter is excessive, a little fruit juice may be given, or better still small amounts of morphine every few hours, a medication which is particularly useful and grateful at this time. After five days, the diet is somewhat relaxed, and for two days the patient receives, in addition to a somewhat larger amount of milk, toast or cracker with unsalted butter and rice prepared with a minimum of salt. Then five more days of milk diet, like the first, follow, whereupon the half-starved patient is fed more liberally.

The results of this regimen are often astonishingly good. The patient soon feels more comfortable and much less dyspneic. The subjective improvement usually comes earlier than the objective, but before the close of the first milk period the latter too, in suitable cases, is evident. The first change for the better is in the quality of the pulse which improves earlier than its rate or rhythm. These often yield only to the subsequent administration of digitalis, but, and this is one of the great advantages of the regimen, the latter is then effective more rapidly and in smaller doses than before. Indeed, it is in just those cases in which digitalis has proved ineffectual that the Karell cure is most definitely indicated. The heart, that before the treatment proved refractory to digitalis, may, after it respond satisfactorily to the drug. The blood-pressure usually shows no change, but occasionally, especially in cases of marked hypertension with little or no evidence of renal disease, the fall in pressure may be considerable and to a certain extent permanent. If the kidneys are seriously involved, and especially if uremia is

impending, the Karell regimen is contraindicated. So radical a restriction of the intake of fluids is then not advisable; the drinking of considerable amounts of water should rather be encouraged. In purely cardiac cases, the diuresis and with it the salt output usually increases, sometimes greatly, and reaches its maximum about the fourth or fifth day. If no diuresis sets in, the treatment is usually ineffectual in other ways also. Diuretics may then be given, but the prognosis in such cases is usually bad. The albuminuria, if present, usually diminishes or disappears, during the course of treatment, provided it was due to passive congestion. If it persist, the presence of organic renal disease may be inferred.

One of the most striking effects of the diet is the behavior of the edema. The latter often disappears rapidly, and even considerable effusions into the serous cavities may be absorbed. Of course, not all cases respond equally well. Leaving out of consideration those patients whose myocardium is too profoundly degenerated to respond to any treatment, the results of the diet will be the better, the more purely the disease is cardiac. Cases of pure myocardial degeneration do best, with those in whom the cardiac weakness follows a valvular lesion a close second. Cases of hypertension do not respond so well, though here, too, good results may sometimes be achieved, while nephritics are usually not benefited. Occasionally, as Wittich has pointed out, the diet will prove advantageous even though no improvement can be observed during the two weeks it is carried out. The response to treatment after the Karell cure may be so marked in comparison with the patient's previous failure to respond, that some portion of the credit must be assigned to the diet. Often, perhaps, usually, it is advantageous to give digitalis, strophanthin or diuretics during the course of the diet, and it then becomes difficult to determine how much of the patient's improvement should be ascribed to the latter. The pure Karell regimen will be most frequently indicated when the patient's digestion has been badly upset by digitalis, or when, for some other reason, it seems desirable temporarily to discontinue the drug.

Digitalis.—Much could be said as to the indications for digitalis and the technique of its administration. The writer will confine himself to a brief discussion of the advantages of the intravenous route. A number of preparations are suitable for this purpose, among which may be mentioned Cloetta's digalen and Gottlieb's digipuratum. Personally, the writer prefers to use another member of the digitalis group, strophanthus. Strophanthin, its alkaloid, is conveniently put up in solution by Boehringer in sterile ampoules, ready for use. Its advantages are manifold. It is especially useful in patients with irritable stomachs, in whom the oral administration of digitalis is promptly followed by nausea and vomiting. Such patients often bear strophanthin intravenously very well. If,

on the other hand, the vomiting is due to a idiosyncrasy against digitalis, the difficulty will not be solved by giving strophanthin intravenously. The patients often vomit violently within one minute after the injection is given and protest vigorously against a repetition of the dose. Even then, they will sometimes react satisfactorily to smaller doses given at shorter intervals.

Another group of cases in which the oral administration of digitalis may advantageously be replaced by strophanthin intravenously is that in which the digitalis is fairly well tolerated by the digestive tract, but fails to produce any decided effect upon the circulation. One gets the impression that in these cases the digitalis is inadequately absorbed, a view that is confirmed by their prompt response to intravenous medication. They often belong to the so-called hepatic type of chronic passive congestion as described by Fränkel and by Sahli. As the result of repeated attacks of insufficiency of the right heart, these patients acquire a chronically enlarged liver with an impaired portal circulation. On the basis of some very interesting animal experiments, Ogawa has shown that digitalis is very slowly but nearly completely absorbed in the normal intestine. If, however, the portal vein be loosely ligated, so as to impair but not abolish the portal circulation, there is almost no absorption of digitalis and a gradual destruction of the drug by the intestinal ferments. The same process doubtless takes place in these cases of chronic hepatic congestion. In a study by Schrenk, of 240 cases of heart disease treated with digitalis by mouth, 55 proved refractory to the treatment. Over half of these belonged to the hepatic type. The writer has recently observed two such cases, both of advanced cardiac decompensation with big livers of long standing. Neither showed the least response to massive doses of digitalis, nor to digipuratum intravenously, but both improved rapidly under strophanthin intravenously.

Finally, strophanthin is preeminently indicated whenever a prompt digitalis effect is important. On account of the slow absorption of digitalis from the digestive tract, no definite effect can be expected until twenty-four or thirty-six hours after we begin giving it. The effect of strophanthin intravenously, on the other hand, may often be observed within the hour. It is thus particularly valuable in cardiac asthma where, especially when combined with a suitable dose of morphine, it usually gives prompt relief.

The danger in the use of strophanthin intravenously is due to the fact that its therapeutic dose is not far removed from its toxic dose. The introduction directly into the circulation of so potent a form of the drug may, in individuals with an idiosyncrasy against digitalis, lead to unfortunate results. This will happen still more readily if the patients have recently been taking digitalis. Here the blood or the heart-muscle contains a certain, even though in-

adequate, amount of digitalis, the sudden addition to which of even a moderate dose of strophanthin may result in toxic symptoms. The danger may, however, be avoided by the observance of two rules. Strophanthin should not be given until at least five days have elapsed since the last dose of digitalis was taken. Moreover, in view of the possible existence of an idiosyncrasy, the first dose should not be over $\frac{1}{2}$ mgrm., which must not be repeated until twenty-four hours later. If the drug is well borne, the dose may slowly be raised to 1 mgrm. daily. Romberg is even more cautious. He waits at least ten days after the last dose of digitalis, begins with $\frac{1}{4}$ mgrm. strophanthin intravenously, waits at least forty-eight hours before giving a second dose, and never rises above $\frac{3}{4}$ mgrm.

The unfortunate, even fatal results that have been observed to follow the administration of strophanthin intravenously, have probably always been due to a failure to observe these rules. On the other hand, the temptation to violate them is often great and their non-observance is not infrequently justified by the event. In desperate cases in which digitalis has been given without avail, we cannot always bring ourselves to wait five days or more before trying strophanthin. Moreover, when a first injection of $\frac{1}{2}$ mgrm. has been followed by an encouraging but fugitive improvement, the writer for one has more than once yielded to the temptation to repeat the dose in twelve hours or less, and so far has escaped accidents. In such cases one must realize that in the face of a desperate situation, one is subjecting the patient to a definite pharmacological danger, and an occasional ill result should not be counted against the treatment more conservatively pursued.

Once the patient is well under the influence of strophanthin, one of two courses may be chosen. The strophanthin may be continued in smaller doses or at longer intervals or both; or it may be replaced by digitalis given by mouth. The convenience of the latter course is obvious. Its disadvantage consists in the possibility that, at some subsequent time, a sudden turn for the worse may make us wish to resume the strophanthin injections. The presence in the system of an unknown quantity of digitalis will then stand in our way.

Other Measures.—Digitalis and strophanthin practically exhaust the list of efficient heart stimulants, with the possible addition of adrenalin intravenously. A good deal of scepticism is justified as to the value of the rest. In the presence of edema and hydrops, diuretics are often indicated. The most active of those now available are theocin or theocin-sodium-acetate. If these prove too irritating to the stomach, they may be replaced by one of the theobromine compounds. If digitalis and the diuretics fail to relieve any considerable collection of fluid, the latter should be promptly

withdrawn surgically, by aspiration from the cavities, by scarification from the legs. The important thing is not to wait too long.

Hydrotherapy, especially the use of carbonated baths, has been much vaunted. The writer has never seen good results that could be definitely ascribed to the home modification of baths, and, at Nauheim, the careful regulation of the patient's whole mode of life is probably the decisive factor in his improvement. Venesection is said sometimes to prove life-saving, especially in embarrassment of the right heart. In the writer's own experience, the patients have always died within a day or two, perhaps because the writer has done it only in desperate cases. Inhalations of oxygen are often very agreeable to the patient, especially at first. They have not apparently much objective value. The slow infusion into a vein of the leg, of a litre or more of oxygen gas, was tried by Dr. Walter Kirchner and the writer some years ago on a number of moribund cardiac patients. We thought there was some improvement, and demonstrated, the writer thinks, that the method was harmless, but a fatal outcome was not prevented in any of the cases.

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SOME UNUSUAL FORMS OF SEXUAL NEUROSES.

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In the following pages, I will not consider the more common forms of sexual neurasthenia, such as impotence, masturbation, pollutions, etc. In all these, from the very nature of the condition, the attention of the physician is at once directed to the sexual apparatus, and the patient is treated either by his regular attendant, or is referred by him to a specialist.

In this paper, however, I desire to discuss some of the unusual forms of sexual conditions, cases in which the patients present symptoms of widely different varieties, and in many cases, not at all suggestive of the sexual apparatus. In reading the cases as reported herein together with their diagnoses presented at the very beginning, it may *appear* not to have been very difficult to have made the diagnosis or to have seen the relationship of the patients' symptoms to the sexual apparatus, but in actual practice it is at times far from easy to recognize that relationship. In the first place, we must remember that the patients do not come to us saying that they are suffering from sexual neurasthenia and have such and such symptoms or conditions. Far from it. As before stated they come complaining of the most diverse symptoms, making no mention whatever of their sexual condition; in fact, in many cases not even suspecting that their condition or train of nervous symptoms bear any relationship to the sexual organs. It often takes considerable questioning to bring out the sexual etiology, and very often the most painstaking examinations and interrogations are necessary before we can determine that the patient's symptoms are due to reflexes from the sexual apparatus. In many cases the genito-urinary specialist must call to his aid the neurologist for differential diagnosis, before ascribing the blame to the sexual organs. Similarly, however, the neurologist should call to his aid the genito-urinary specialist for a complete examination of the sexual organs in cases which fail to respond to treatment and where the etiology is doubtful.

I might here state, in passing, that the average physician has not yet awakened to the importance of the male sexual organs as a source of *reflex* nervous symptoms, as compared to the

female sexual apparatus. In the latter class of patients the pendulum seems to have swung *too far*. The physician has long since learned the important influence that the female sexual organs exert on every organ of her body. No physician would neglect thorough gynecological examination where the etiology of any nervous condition is not clear. I have said that there has been too much zeal in this direction, and many women are subjected to treatment and operation because of some slight, supposedly pathological, condition found, which is thought by the examiner to be the source of all her woes.

For a study of sexual neuroses we must *not* look to the genito-urinary clinics. To make a study of these cases I associated myself with the neurological class of Dr. Abrahamson, at the Mount Sinai Dispensary, where all such cases were referred to him except when otherwise stated. A special room was set aside adjoining one of the neurological rooms, where I made a complete genito-urinary examination of all cases sent me. Besides taking a complete history of each case, palpating the external genitals, and the prostate and seminal vesicles per rectum, I examined the anterior urethra with the ordinary endoscope, and the posterior urethra with the Wossidlo-Goldschmidt posterior urethroscope. The patients did not come to the dispensary complaining of sexual trouble. They came complaining of various neurological symptoms, and if Dr. Abrahamson, after going into the history, suspected or determined that there was a genital source for their trouble, he referred them to me for genito-urinary examination, and when suitable, for treatment. It was in this way, and not through the genito-urinary clinics with which I have been and am still connected, that I have been able to make a special study of these cases as well as those of impotence, masturbation and kindred ailments. I believe this plan of having a genito-urinary examining-room in connection with a neurological department is a most excellent one—a far better practice to my mind than the one so often seen in other neurological clinics where these patients are often dismissed with a dose of bromides or a tonic, without even a pretence of a genito-urinary examination.

Sexual Neurasthenia Masking Behind Symptoms of Sciatica.—The patient, A. W., a painter, had been treated at various neurological clinics for over a year for sciatica of the left side. He had had the usual treatment. His previous history is briefly as follows: Patient complains of pains in the left lower extremity; is excitable; has severe tenderness in the left sacro-iliac joint. He was treated by electricity, including the high frequency current, hot air, hot baths, as well as iodide of potash, but all without avail. He finally had to stop working at his trade, as he could not climb ladders or work on scaffolding. His general condition was poor and he looked

much emaciated. He was then referred to me for examination. I found the prostate enlarged and tender; but especially the left seminal vesicle (the side of the sciatica) was very much enlarged and nodular. This, with his emaciated condition, and in the absence of a history of gonorrhea, made me suspect tuberculosis. However, an examination of the secretion of his vesicles and prostate obtained by massage, as well as his urine, failed to show any tubercle bacilli. I cystoscoped him also, and found his bladder normal. I treated him by massage of the prostate and seminal vesicles; at first once a week, and later every other week. After six treatments he felt much better, and after ten treatments was entirely cured and could do all the work necessary in his trade. The local condition of his prostate and seminal vesicles also became normal, and his general condition improved markedly.

In this case it must be borne in mind that there had been absolutely no improvement for over a year, and that while under my care, the patient received absolutely no treatment, medical or otherwise, except massage of the prostate and vesicles. The etiological cause in this case was the practice of withdrawal, of which, however, the patient made no mention in giving his history, not thinking that it had anything to do with his condition. This case recalls to my mind the good results obtained by Fuller in the treatment of chronic arthritis (even in non-gonorrheal cases) by drainage of the seminal vesicles.

Sexual Neurasthenia with Unusual Sexual Symptoms.—Patient has been married ten years. He has had three or four attacks of gonorrhea, the last attack being fifteen years ago. Has had also a left epididymitis. He is sterile and his semen shows no spermatozoa. Urination is normal by day and never by night. His chief complaint is that at night, and only at rare intervals he is seized with a severe pain in his penis, located about three-quarters of an inch from his meatus. This pain lasts about an hour, during which time the entire penis shrinks up (does not bend) and his testicles also become heavier and smaller. If an erection comes at this time, the pain subsides. This the patient ascribes to the stretching of the penis. An examination shows signs of an old epididymitis, and also a thickened right epididymis. This condition is sufficient to account for the sterility. The prostate is enlarged. The urine is turbid and full of long shreds. With the bougie à boule, a distinct stricture is found in the anterior urethra at the site of the pain, and with the endoscope we also see a distinct stricture (hard infiltration) at that point.

With the above urethral findings, one would at once naturally conclude that the stricture was the cause of his symptoms. This, indeed, was my impression. I therefore treated the patient

with dilatation of the stricture, together with massage of the prostate at intervals in order to reduce its congestion. It must be remembered that previous to the patient's coming to me, he had the attacks only at *rare* intervals. As the dilatation of his urethra progressed, I noticed that although the local condition had so far improved that he could take a large size sound (30 F.), there was absolutely no change in his symptoms. In other words, these continued to recur at the same rare intervals. I was, however, struck with the fact that whenever the prostatic urethra was irritated, either by the urethral sound or by prostatic massage, a typical attack was evoked that same night. In other words, it was noticed that as long as the condition of the anterior urethra was treated by staffs which only touched the anterior urethra, no effect, either good or bad, was experienced by the patient, but as soon as these staffs were replaced by sounds which passed into the bladder, the symptoms at once became aggravated. I further noticed that although the stricture was situated in the anterior urethra, no bleeding occurred if only the anterior staffs were used, whereas a sound passed ever so gently into the bladder would almost always be followed by some bleeding. I then concluded that in spite of the presence of a stricture in the anterior urethra and the location by the patient of his pain almost precisely at the site of the stricture, this was only a concomitant condition, and not at all the cause of his symptoms. As soon, therefore, as his anterior urethra was sufficiently dilated, I examined the posterior urethra with the Wossidlo-Goldschmidt posterior urethroscope. This instrument showed a marked congestion of the entire posterior urethra with several erosions. I had intended to make direct applications to the posterior urethra through the endoscope, but on account of the extreme congestion present (even the introduction of the instrument or of a sound being followed by hemorrhage) I determined first to relieve the congestion by instillations of weak silver solutions with the Bangs sound syringe, gradually increasing the strength of the solution and the size of the sound syringe. It might be added, in passing, that in cases where applications to or operations in the posterior urethra through the posterior endoscope are necessary, but where there is such extreme congestion of the parts as to preclude the passage of the instrument I have found it expedient to give a preliminary treatment as above, until the congestion was relieved. Accordingly, every fifth day and later at longer intervals, the prostate was gently massaged and deep instillations of very weak silver nitrate solutions given (starting with 1:3000 solution and a 16 French sound syringe). As before stated, the strength of the solution and the size of the sound were gradually increased, with the result that the attacks at first became less severe and later ceased altogether,

so that finally it was not necessary to use the Goldschmidt instrument at all in order to make direct application.

In reviewing this case, it must be said that while reflex symptoms coming from a congested prostate and posterior urethra are various and numerous, I have never seen reported a symptom-complex like the above, and other genito-urinary colleagues with whom I have spoken tell me that they also have never had a similar case. It must be stated here, that had the picture not been confused by the findings in the anterior urethra, attention would certainly have been drawn at once to the prostate and prostatic urethra.

Pruritis Ani Due to Reflexes from the Prostate.—Although cases like the following have been previously reported, they are rare and not generally appreciated, so that it would seem advantageous to call attention to the condition.

The patient, S. T., complains of severe itchings in and also about the anus, for which he had been treated without any result for a long time. He is thirty years old, single, and had gonorrhea six years ago. Coitus is normal, urination five or six times a day and sometimes at night. Seldom has wet dreams, and has never practiced masturbation. Urine is normal except for the presence of excess of oxalates. Examination shows an enlarged prostate, and fissures around the anus.

Here again the etiology was obscure. Itching is a very common symptom in connection with anal fissures, and one would believe the etiology to be very simple. However, the patient had been carefully treated for a long time for this condition, before coming to me without result.

I treated him by massaging his prostate once a week, together with an application of 5 per cent. silver nitrate to his anal region. The result was that after only four treatments his pruritis had entirely ceased and has remained away up to date. For theoretical considerations it would perhaps have been better to have omitted all treatment except the prostatic massage, but I did not think it right to omit anything that might prove of benefit to the patient's most distressing condition, even though the etiological factors might thereby escape. Perhaps it was the combination treatment that did the work, but certainly the massage of his prostate must have contributed greatly, because as above stated he had received the local treatment before, without any result.

Sexual Symptoms in a Psychopath Not Dependent Upon Condition of the Sexual Organs.—I desire to report this case as a direct contrast to the others, showing that we may have cases of sexual neurasthenia with pronounced sexual symptoms, with definite genito-urinary findings, yet in which the symptoms are entirely psychic and only remotely caused or influenced by the condition of the genito-urinary apparatus. Cases like the present

one ought to be reported and emphasized in order to prevent us from claiming too much, and so make the genito-urinary specialist too narrow, causing him to imagine that everything revolves about the sexual organs. In cases like the following, the genito-urinary specialist should call the neurologist to his aid and the latter can probably cure the patient by psychic treatment.

H. S., referred by Dr. Ziegel of the Mt. Sinai Dispensary, November 1st, 1912. He is single, *æt.* twenty-one. Six years ago he practised masturbation almost daily, over one and a half years. This was followed by a continuous prostaticorrhea lasting five weeks. Two years ago he was treated by a quack physician who massaged him for one year. His chief complaint is that he imagines he feels his spermatic fluid circulating all through his body. He believes that he will not get well until his system is rid of this contamination. He expectorated into his handkerchief and explains that he feels and sees the spermatic fluid in the saliva. Now he complains of pains all over his body which he attributes to the action of the spermatic fluid poisoning his entire body.

Examinations of the genitals show a varicocele, and an atrophic prostate. The posterior urethra, examined by the Wossidlo-Goldschmidt posterior urethroscope, exhibits a practically normal verumontanum, with a marked erosion in the left lateral sulcus, and with an erosion at the opening of the left ejaculatory duct. The entire urethra is hypesthetic, the patient experiencing no pain or tenderness on passage of the instruments. There is no congestion of the verumontanum and the entire urethral picture, as well as the condition of the prostate as felt per rectum, is the direct opposite to what we find in cases of masturbation. The slightest palpation on the prostate brings fluid to the meatus. He urinates every two hours by day and rarely by night.

With this pronounced sexual history, and the definite genito-urinary findings, one might believe the relationship of cause and effect very direct. However, the patient came to the dispensary at irregular intervals and was treated by deep instillations of silver nitrate, and direct application of strong silver solution to his erosions through the urethroscope, and while his urethral condition cleared up entirely, and while there were no pollutions, and he ceased to masturbate, yet there was absolutely no improvement in his psychic condition. He still felt his spermatic fluid coursing through his entire system. I believe him to be a psychopath and a case for mental rather than for genito-urinary surgery.

Severe Anxiety Neurosis Due to Prostatic Irritation.—This case is reported because it is an extreme case of depression due apparently to no other cause than reflexes originating from a congested prostate induced by previous masturbation. This is but one of many cases, although in general they do not present such severe

symptoms. This case did not come into the genito-urinary clinic for examination of his sexual apparatus, but into the neurological department of Dr. Abrahamson, and from the careful history taken in this department, the relationship was easily recognized, and he was at once referred to me.

M. G., single, *æt.* twenty-six, came into the neurological department of Mt. Sinai Dispensary on November 3rd, 1911. His history, as copied from the neurological blank, is briefly as follows: Gonorrhea four times; last attack six months ago. Began to masturbate at fourteen and stopped three years ago. Duration of present condition, five years. Is depressed; believes that his face does not look as it should; believes that people looking at him realize that there is something wrong with him. Knows that people doubt him. Memory good; sleeps fairly well; dreams rarely. In company of men feels small; in company of women feels very small and bashful. Believes that people can read the truth from his eyes and know what ails him. Hates and loves all women. His main worry is his eyes; feels sure that if his eyes were different he would feel perfectly well. Feels that his eyes are weak because of weak nerves brought on by onanism and too much sexual intercourse. Life is not worth living. Does not masturbate any more. Polutions rarely. Intercourse every two or three weeks. Sometimes believes that he will become insane and believes that he knows how he will act should that ever happen. He is very excitable and there is a lack of concentration. His general appearance is dull and apathetic. He also complains of severe headache and dizziness. All I found on examination was a very enlarged and tender prostate. The only treatment he received was massage of the prostate once a week. At the end of two months, when he made his last visit, practically all his symptoms had left him.

I suppose that many neurologists with such a distinct sexual history would consider this an ideal case for psychoanalysis, but here Dr. Abrahamson reversed his usual procedure and had the sexual apparatus investigated and treated first, before resorting to psychic treatment. To try to cure a patient by psychic treatment alone, while there exists a constant stream of reflex irritation sent to the brain from a congested prostate, is a mistake too commonly made. The ardent disciples of Freud, in their enthusiasm, are apt to be entirely too narrow in their interpretations.

Tremor of Hands Due to Prostatic Irritation.—Tremor of the hands is a common symptom in many nervous affections. In fact it is a common sign of 'nervousness' using the term in the popular sense, but it is rather unusual to find it the only symptom of a congested prostate.

W. S., single, *æt.* twenty, was referred to me in June, 1911. His only complaint was a marked tremor of the hands which inter-

ferred with his business. He never had any venereal disease, rarely has wet dreams, and coitus, though rare, was normal. He likes to 'fool' with girls. The only thing I could find wrong was a moderately enlarged but rather tender prostate gland which was most probably the result of the unnatural sexual excitement of too much spooning. He received no medication, and was treated merely by prostatic massage and deep urethral instillations of silver nitrate solution. He was also cautioned against all manner of sexual excitement. As a result, in six weeks the tremor had entirely disappeared. He remained well for about two years and then returned with exactly the same symptom again, due to the same cause. This time the condition was complicated by nocturnal pollutions. He was again put on the same treatment with the same good result, and is at present absolutely well. How foolish it would have been to have dosed this patient with bromides or to have given him electricity or tonic treatment!

Nervous Exhaustibility Due to Prostatic Irritation.—This is a very common condition, and is merely inserted to illustrate a common type of sexual neurasthenia.

M. L., *æt.* thirty-nine, married but separated from his wife, complains of loss of memory, lack of concentration of interest, and other general nervous complaints. These symptoms are common to the most diverse nervous conditions, and it was only after more minute interrogation that the following important facts were brought out in the patient's sexual history which contained the clue to the etiology and to which the patient in the first instance attached little importance. It was elicited that the patient had lost all sexual desire and that for some time previous to his separation he had practiced withdrawal. Upon examination a very enlarged and tender prostate gland was found, and the posterior urethroscope showed a remarkably congested prostatic urethra.

Patient was treated by massage of the prostate and by the application of 10 per cent. silver nitrate to his verumontanum through the urethroscope.

The improvement was very gratifying and very rapid. After a few treatments the patient himself remarked that he was regaining his former energy.

As stated at the beginning of this paper, the etiology might seem very easy when read in connection with the diagnosis placed at the head of the history, but it is a far different state of affairs when the patient attends the neurologic clinic, mingling with many organic and functional nervous cases, giving no sexual history of himself except such as is painstakingly elicited by the examiner.

It might be objected by some, that the symptoms as well as the good results obtained in the cases just outlined were not due to the conditions found, or to the treatment of the sexual organs, but

that these good results were perhaps due to the psychic influence of the treatment. I do not wish to deny the psychic effect produced by the treatment. The introduction of the lighted endoscope or cystoscope is full of possibilities hitherto unknown to the patient. There is first the direct seeing of the disease focus, which, like an *x-ray* examination, appeals especially to the layman; secondly the patient very frequently believes that light and electricity are both very beneficial in their therapeutic effects; and, lastly, the novelty of the procedure impresses the patient with the thoroughness of the examiner. But in spite of all this, which only in some cases is a concomitant feature, I feel certain that the good results were mostly due to the treatment itself. In the first place the lesions in the genital apparatus were actually present, and the symptoms were improved, generally parallel with the improvement in the local condition. But what is significant is the fact that most of these patients had received treatment for a very long time with other procedures which must have had a greater hold on their imagination than my treatment. Take for instance the case giving symptoms suggesting sciatica. After the preliminary examination, the patient received no other treatment than massage of the prostate and seminal vesicles; surely the psychic effect produced by this procedure could not compare with that resulting from months of treatment with the high frequency and other electric currents. Nevertheless, this treatment proved efficacious while the others failed dismally. Again, the patient with attacks of pain in his penis—at first the dilatation of his anterior urethra with the Kollmann dilator had absolutely no effect, either good or bad, on his symptoms. If the case were purely psychic, a Kollmann dilator would have had more effect than rectal manipulation. But we see that this did not occur and he only got well as soon as the prostatic urethra was treated, and the local lesion cleared up. Going through all these cases, therefore, we note that almost all of them were treated by prostatic massage and deep urethral instillations, procedures which are certainly not at all calculated to impress the imagination.

I wish to draw attention to the fact that the various neuroses are psychanalytically investigated by the neurological department before they are sent to me. It is only after failure to elicit the etiological factor, or failure of the psychanalysis itself to benefit the patient, or failure of educational attempts of therapeusis, that the patient is referred to me for examination and possible treatment.

In conclusion, the object of this paper is to draw attention to the male sexual organs as the cause of profound nervous symptoms in many cases. I do not wish by any means to convey the impression that the male sexual apparatus is the hub around which

the neuroses revolve. I have, therefore, purposely reported my failure to cure the patient by treatment directed to his sexual organs, in one of the types of cases, in spite of the fact that lesions in these organs existed, and were influenced favorably by treatment. We all know that severe nervous symptoms may follow errors in refraction, errors in digestion and assimilation and other reflex irritations from almost any organ in the body, but I do plead for a more careful investigation of the male sexual apparatus in functional nervous diseases in such cases which fail to respond to treatment and where the etiology remains in doubt.

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REMARKS ON THE MANAGEMENT OF CRITICAL CASES OF SENILE PROSTATES WITH REFERENCE TO THEIR TREATMENT PRELIMINARY TO PROSTATECTOMY.

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The disturbance and shock from instrumentation of the urethra and bladder are often very marked. In fact, frequently we find the shock in direct proportion to the roughness of the manipulation. The very beginning of the treatment of such cases should be approached with the utmost care and gentleness. This is prominently so in any procedure about the urethra or bladder, but especially are we impressed with the necessity for employing extreme care in handling those cases of prostatic hypertrophy in which the kidney function is seriously damaged. Often the slightest lapse of precaution will turn the tide against them.

The writer knows of no one who is in a more precarious condition than the prostatic who has complete retention grafted upon an old obstruction to urination, with infection which has been going on for a long time and whose kidney function is badly impaired.

As death is nearly always due to the fact that the kidney is either crippled in its function, or, more or less, destroyed, it is to the restoration of the function of this organ that our endeavor should be directed. By judicious management, in some cases the kidney may regain much of its tone.

Many of the critical cases of senile prostates that come to operation are undoubtedly saved by being put into condition before attempting radical measures.

All the organs of the body (heart, lungs, etc.) should be carefully looked into for defects, but especial attention should be paid to kidney function.

Even though the kidney be apparently good, great care should be taken to get the patient accustomed to manipulative interference in order not to shock the kidneys too severely or too suddenly.

It is surprising how patients who have stood badly the beginning of manipulations about the urinary organs, will later tolerate major procedures when they have become accustomed to minor instrumentation by gradual steps. The first catheterization carries with it so much for good or evil that its importance cannot be too strongly insisted upon.

In the treatment of advanced prostatics the catheter is our first

reliance, and, if tolerance is established, all is well for the time, but sooner or later difficulties will arise which make catheter life unenviable, and positively dangerous. Furthermore, catheter life, with its chances of infection and failure to furnish efficient drainage to the kidneys, carries with it dangers which outweigh those of operative measures, provided these measures are undertaken advisedly. Preliminary treatment, especially in the desperate cases, is essential to mitigate the dangers of the operation and prepares the patient to withstand in a large measure the surgical ordeal.

As prostatics come to us for treatment, that is clinically, we recognize these classes:—

(1) Those that have slight irritative symptoms with little or no retention.

(2) Those that have much local disturbance without appreciable retention.

(3) Those that have urinary difficulties with considerable retention.

(4) Those that have complete retention.

(5) Those that have dribbling, usually from overflow.

The first class—namely, those that have irritative symptoms with little or no retention, may, so long as they remain in this class, be kept in fair comfort without the use of the catheter or operation, and do not concern us here. The other classes are those cases which need radical measures; for even though in some cases the catheter has relieved the most apparent symptoms for years, sooner or later the time will come when infection, local or general, or urinary toxemia will prove fatal.

As a temporary expedient, however, in the treatment of prostatics, preliminary to operation, the catheter is indispensable.

Where regular catheterization is feasible and relieves the symptoms and kidney disability, it is our easiest and best means of preparatory treatment. Often it so succeeds that the patient improves generally and the kidney function rises.

But there are many difficulties encountered. It may be impossible to pass the catheter. It may be so difficult to pass or cause so much pain as to preclude its use. Chills and fever may develop, and urinary toxemia threaten the patient's life. These latter phenomena are very apt to happen if there is serious impairment to kidney function.

Where interrupted catheterization fails to produce improvement, we will often succeed with the retained catheter (catheter à demeure), but here, too, at times we meet with failure. The very symptoms we endeavor to abate may be enhanced or caused by the procedure. The catheter may not be tolerated on account of the irritation of its presence; chills and fever may develop and uremic symptoms continue.

In cases where catheterization is impossible or not feasible, or where failure seems imminent, perineal or suprapubic section with drainage under local anesthesia should be done, and drainage continued until the patient sufficiently recuperates to undergo the radical measures. We are often tempted at the time of making the section to proceed further and remove the obstruction, so as to save the patient from two operations, to save time or with the idea that the additional surgery will add little to the danger of the operation; but it is just this little that often turns the tide against him. The additional anesthetic, however little, that is necessary for the removal of the prostate, is also a factor of no small consequence. Drain first until the patient is in better condition, then proceed with the final step. If he does not stand the preliminary section, it is certain that he would not have stood the complete operation. It is very striking how little shock there is, and how little the patient is affected by the completion of the operation after he has been thus drained.

Of the two methods of drainage the suprapubic is preferable for the following reasons. The deep urethra is its vulnerable part. When we invade this locality of the canal, urethral phenomena are apt to show themselves. It is from this location that we get shock and urethral chills following instrumentation. It is from this part that infective absorption takes place. This is the part that we hesitate to molest with cutting instruments without adequate drainage. The inlying catheter must pass through the prostatic urethra to reach the bladder, and irritates it to a certain extent. The base of the bladder is not well drained.

With these facts in mind it is no surprise that the catheter lying in after perineal section should excite some phenomena which are absent in the high method.

After suprapubic section the absence of pain and discomfort are factors of no mean consideration. There is no obstruction to the outflow of urine, drainage is sufficient and the back pressure is completely removed. The patient is comfortable sitting down and may be taken outdoors in a chair without discomfort.

Suprapubic section is easily performed under local anesthesia, especially if the bladder is much distended, a condition which pushes the anterior bladder wall almost against the muscles of the abdomen; or if there is uremia, which lessens markedly the patient's sensibility to pain. Again the suprapubic furnishes a means of knowing the complications in the bladder, such as an encysted stone, papilloma, diverticulum; and in the desperate cases, where previous cystoscopy is not possible or advisable, the suprapubic route is essential.

As improvement of kidney function is our chief aim with all of the above procedures, such remedies as improve kidney activity

must be strongly insisted upon. Hexamethylenamine is administered, water by mouth pushed, and saline solution given freely by rectum or hypodermoclysis, or both combined, using such other remedies as indications arise. But the free use of salt solution increases kidney activity markedly. The patient's strength may be improved by getting him up and about as soon as possible.

The following 2 cases illustrate the value of suprapubic drainage after other measures have failed.

CASE I.—J. F. S., of Bonne Terre, Mo., referred by Dr. McNutt, came under the writer's observation with complete retention. Interrupted catheterization was employed for one week. The kidney function diminished and uremic symptoms developed. The patient became entirely oblivious of his surroundings. Suprapubic section under local anesthesia was now done. Within a few days the urinary output had improved, and the uremic symptoms cleared up. The patient picked up generally, so that fourteen days later, he was in condition for further procedures. The prostate was now removed suprapubically. The operation disturbed him very little and a rapid recovery ensued. In three weeks he left for his home in good shape.

The rapid improvement in the patient after the suprapubic cystotomy is in marked contrast to the rapid decline under catheterization.

CASE II.—B. M., of Miller County, Mo., referred by Dr. Duncan, had constant dribbling of urine from overflow. The retention amounted to 45 oz. The bladder was emptied by gradual steps by the fourth day. On the third day after the passage of a No. 12A catheter, which seemed large, he had a chill followed by fever. The fever gradually disappeared, but his general strength began to fail, loss of appetite appeared, and he seemed to be rapidly declining. Five days after the first catheterization, saline per rectum was begun. On the next day catheter à demeure was employed, but the patient pulled it out during the night, partly on account of the pain from its presence, and partly because he was somewhat irresponsible. This was replaced the next day and continued for four days. During this time the patient's hiccough was continuous. His uremia deepened and the urinary output had much diminished. He had hallucinations. Suprapubic section was now done under local anesthesia. The patient was so uremic that he did not know anything about it. His hiccough and other uremic symptoms disappeared within three days. Ten days later, he had so far recovered as to permit the removal of the gland. Although the prostate was hard and fibrous, and was with the greatest difficulty and with the expenditure of much time made to peel at all, the operation shocked the patient scarcely any. He made an uninterrupted recovery.

The radical change in these two patients almost immediately after the bladder was opened, with no change in treatment otherwise, can be ascribed to nothing else than the efficiency of the suprapubic section.

There will always be certain cases that do not respond to drainage, but they are cases that will not respond to anything, certainly not if more shock is added in the way of a complete operation.

Whether the perineal or suprapubic removal of the prostate should be undertaken as a further procedure, the writer believes lies mainly with the choice of the operator and depends upon his aptitude in doing it.

When we have the suprapubic opening in the bladder, the writer prefers to complete the operation by this route; for in the majority of cases it is easily performed, and the ultimate results, so far as bladder function is concerned, are much the better. Time is saved and less anesthetic is required. Even in the fibrous cases better access to the removal of the obstruction is obtained.

MEDICAL AND SURGICAL PROGRESS.

RECENT ADVANCES IN CANCER RESEARCH. INFLUENCE OF HEREDITY IN THE INCIDENCE OF CANCER.

A REVIEW OF RECENT LITERATURE.

By MOYER S. FLEISHER, M. D., of the Editorial Staff.

1. Thoul (*Verhandl. der deutsch. path. Gesellsch.*, 1908).
2. Jensen (*Zeitschr. fuer Krebsforsch.*, Vol. VII, p. 285, 1908).
3. Bashford and Murray (*Proc. Roy. Soc.*, Series B., No. 81, p. 310, 1909).
4. Murray (Fourth Scientific Report of the Imp. Cancer Research Fund, p. 114, 1911).
5. Tyzzer (*Journ. Med. Research*, Vol. 17, p. 139, 1907).
6. Tyzzer (*Journ. Med. Research*, Vol. 21, p. 779, 1909).
7. Slye (*Zeitschr. fuer Krebsforsch.*, No. 13, 1913).
8. Slye (*Journ. Med. Research*, No. 30, p. 281, 1914).
9. Lathrop and Loeb (*Proc. Soc. Exper. Biol. and Med.*, Vol. XI, pp. 34 and 38, 1913).

The question regarding the influence of heredity in the incidence of cancer, has naturally been one which for a long time has held the attention both of the medical and the lay public. There have been much theorizing and much argument; but since both in the past and at present, in dealing with humans, the number of uncontrolled factors was too large to permit of any definite facts being brought out, all these theories and arguments have come to naught.

On account of cancer research having come more into prominence in the last fifteen years, efforts have been made to collect statistics which might help us materially toward a solution, but here again the uncontrollable factors enter, and until we have at our disposal many more and more extensive statistics than we have been able to collect in the relatively short period of twenty to twenty-five years, we can obtain but little knowledge regarding the influence of heredity from the figures. However, with the knowledge that cancer is prevalent among some species of smaller animals, and especially among mice, with the added factor that the life of these animals is usually about two years, and that they begin breeding at six months or even younger, we have at hand a suitable and favorable material for an experimental investigation of the influences of heredity.

We find that, as a rule, mice have been used in these investigations. In the earliest of these, there are relatively few statistics

and they are rather poorly worked out. Thoul states that among 60 mice of one family, only 14 developed tumors; the question of age at the appearance of the tumor, the type of tumor, sex of the affected animal and other details are not given.

Jensen gives us data concerning two families of mice. The first family was descendants of a cancerous female, but in 50 mice none developed tumors. The second family was also descended from a cancerous female which had 4 young, one of which developed a tumor. In the next two or three generations there were between 400 and 500 animals, but only 3 developed tumors. Jensen states that many of the animals died when young—before the age at which mice usually develop cancer, so that with the data at our disposal it is impossible to state whether this represents a large or small percentage.

Tyzzar was one of the first carefully to consider all the details in connection with the influence of heredity, and he also worked with a much larger material than either of the investigators previously mentioned. He has, however, made a mistake in listing, among his tumor-bearing animals, a number with tumors which are either not considered by many investigators as tumors, or which are generally considered as simple hyperplastic or inflammatory conditions rather than actual neoplasms. He puts among his tumors, lymphomata which are not generally accepted as tumors, and also cyst adenomata of the lung, which are generally considered as hyperplastic conditions due to irritation. He does not contend that the majority of these lung tumors are malignant—indeed, states that but few actually became carcinomata, but he does believe that they are neoplasms.

Putting aside the question of whether or not we may class all the tumors, which Tyzzar considers, either as malignant or benign neoplasms, we shall consider his results concerning the development of tumors in certain families.

In one family there were 24 offspring of a mother who had had cyst adenoma of the lung; 3 of these developed tumors while still under fourteen months of age. In a second family there were 29 young born to a female which died with a lymphoma; 5 of these developed tumors of various kinds. Out of 7 which reached the age of one year, 3 developed tumors. It thus appears that in the latter part of life, the mice become more susceptible to cancer. In a third family a considerably larger number of mice were used, and 62 lived to maturity; 32 per cent. of these showed one or more tumors. In this family we find a fairly high rate of cancer incidence.

Tyzzar further analyzes his results, grouping (irrespective of family) those mice which sprang from cancerous parents and those which did not. In the former group we find cancer occurring in 50 per cent. of mice which lived longer than six months; in the latter case, only in 23 per cent. The difference is quite as marked in mice which lived more than two years: in the mice whose parents had no tumors, 50 per cent. developed tumors, while in the group with tumor parents, 75 per cent. developed tumors.

We would not be justified in drawing from those figures the conclusion that the offspring of parents with tumors are more liable to develop tumors, for certain facts complicate these results, since we are dealing with different families in each of these lots. Naturally, in the lot with parents bearing tumors, we find that the ma-

jority of the parents will be of families in which the cancer rate is high, therefore it is natural to expect that the offspring in this group would show a larger incidence of tumor due to their belonging to a susceptible strain. It is evident that before the statement may be made that a tumor in the parent predisposes the young to development of a tumor, the figures must be further analyzed.

Tyzzar believes to have shown that heredity must be given credit for some influence in the occurrence of cancer, but as we have stated in the beginning, the consideration of his results on the basis of his figures is uncertain—what he has considered as tumors are not generally accepted as such.

Murray, who has published the later and fuller report of the work which he and Bashford first published, considers, in contradistinction to Tyzzar, only the definitely accepted cancers, and furthermore his statistics are based only upon the occurrence of cancer in female mice. In the majority of cases, cancers in mice occur in the mammary glands and are therefore very much more prevalent in the females; indeed, are extremely rare in males. In this fact he finds the justification for considering only the females. Furthermore, Murray considers only mice which lived more than six months—for rarely does a tumor develop in a mouse under this age.

Murray divides the mouse's life into periods of three months, and finds that in the period between the fifteenth and eighteenth months the cancer-rate is highest; before this age it has gradually increased, and after this age we note a gradual diminution. This curve of cancer incidence is similar to that noted in the human female for mammary cancer, or for cancer of all kinds. In the mice—some 562 were examined—cancer occurred in 14.4 per cent.

Murray has also divided the mice into two lots—those in which the immediate ancestors, mother or grandmother—had cancer, in which lot 18.2 per cent. had cancer, and those in which there was no cancer in the mother or grandmother, in which mouse cancer occurred in 8.6 per cent. Furthermore, in each of the three-month periods the occurrence of cancer in the first lot, in which there was cancer in the immediate ancestry, was greater than in the second lot.

The same objection is valid here as was advanced against the similar considerations of Tyzzar. Although account is taken of the percentage of cancer incidence in families, what here appears to be a greater occurrence of cancer in the offspring of cancerous individuals, should, in all probability, be traced back rather to a greater cancer incidence in certain families. However, his results bring out certain facts. The gradually increasing incidence of cancer in the later life of the mice, corresponding to the conditions in humans, and probably even more than a suggestion that heredity may be through individual parents, more likely through families (for in the one lot he has put mice whose two immediate female ancestors had cancer), has a definite influence on the incidence of cancer. The appearance of cancer, in the later ages of the mouse, naturally corresponds with a period at which full maturity has been reached and the activities are turned largely toward reproduction. The injury to the nipples and breast, as a result of the nursing of the young, may be a factor in the occurrence of cancer.

Slye has studied the incidence of cancer in certain strains or

families of mice, and finds (including in her enumeration both males and females) that the incidence of cancer varies in different strains from as low as 16 per cent. to close on toward 100 per cent. Where it was 100 per cent. the mice had been inbred for twenty-five generations before the observations regarding the incidence of cancer were made. She, therefore, finds that in some families the incidence is very high, in others very low, and in a large number the incidence of cancer is about 50 per cent. In families in which the cancer rate is high, leukemia occurs in a number of mice in which cancer does not develop, and Slye believes that this must, in some manner, be connected with the tendency toward cancer. She included, among her statistics, mice with lung tumors, but only such as were definitely malignant. In mice from cancerous strains, the so-called lung tumors were very much more likely to develop into malignant tumors than in mice from strains with a low cancer incidence, in which the lung condition continues simply as an inflammatory process.

Slye speaks of cancer as a "mode of growth" which is influenced by heredity. In the prime of life or reproduction period, it occurs chiefly in strains susceptible to cancer. In the latter period of life, when cancer is most common, it is quite as frequent in mated as in non-mated mice, and in the latter is due to a failure to use the metabolic products in the reproduction period. She furthermore fails to find any evidence of cage infection—thus mice living in the same cage with cancerous mice do not develop cancer unless they be predisposed by heredity.

Loeb noted, many years ago in rats and in cattle, the endemic occurrence of cancer, and suggested that it was possibly to hereditary factors that we must look for an explanation of these appearances of several cases of cancer. These observations, made nearly ten years ago, led to the investigations of Lathrop and Loeb. They were able, in breeding large numbers of mice, to obtain strains in which the cancer incidence varied between $3\frac{1}{3}$ per cent. and 82 per cent.; the incidence in the various strains was nearly constant in the individual generations, and substrains obtained from the original, as a rule, showed the same cancer incidence as the original strain; in one case the latter statement did not hold.

The time of appearance of the tumors varies also in the different strains; on the whole, in those strains in which the cancer rate was highest, the tumors appeared earliest.

In most strains Lathrop and Loeb found the incidence of cancer to increase with age; however, in one strain which was especially suitable for observation through old age, they found a curve similar to that which Murray finds, showing the gradual diminution of incidence in old age.

In one case where mice with very low cancer incidence were mated with mice with high cancer incidence, the resulting hybrids showed a high incidence; in this case it was the male from the strain with high incidence which transmitted the tendency to cancer.

In cases of other crosses the results were not as clear; in one case the mating of a strain with high incidence with a strain of medium incidence gave hybrids of low cancer rate, while the mating of the same strain of high incidence with a strain of low incidence gave hybrids with a high cancer rate.

Furthermore, in a strain with a very low cancer incidence, the

mice grow and mature very slowly and they are poor breeders. In other cases mice with high cancer incidence grow rapidly and are good breeders. This parallelism was, however, not apparent in all cases.

When mice from non-cancerous families were placed in boxes with cancerous mice they showed no tendency to develop cancer.

Lathrop and Loeb studied the influence of breeding upon the incidence of cancer, and found that in some strains of mice in the bred mice, cancer was more frequent and occurred earlier than in the non-bred mice; however, in those strains in which cancer incidence is highest, they also find the cancer incidence highest in the non-bred mice. Slye finds that there is no difference in the incidence of cancer in bred and non-bred mice; it may be that in different races or strains of mice this influence may vary, and this factor may explain the difference between the results of Loeb and Lathrop and those noted by Slye.

Lathrop and Loeb, therefore, believe that heredity is a definite factor in the incidence of cancer, but that other factors are also probably at play.

It should be remembered that this experimental work has not yet given any definite answer to the question of the influence of heredity in cancer of humans. It will require many more years of investigation before we can hope for this. However, as regards the heredity in mice, at least one very important question has been answered—namely, that there is unquestionably a certain predisposition or tendency to development of cancer which may be transmitted by heredity. We have no evidence that the development of cancer in a parent means that the offspring are liable to cancer, for the cancer may have been an isolated case in an individual of a family not subject to cancer; but if the parent represents an individual from a family in which cancer occurs in a relatively large percentage, the offspring as a result of the conditions existing in the family will have a hereditary predisposition to cancer, even though there has occurred no case of cancer either in parents or grandparents. We see thus that we cannot speak of a hereditary tendency passed from parent to offspring, but must speak of the influence as being transmitted through a whole family. It must further be borne in mind that these families of mice have usually been inbred, and therefore the conditions in these experiments differ very decidedly from the conditions we would meet with in humans. We are not, as yet, in a position to state definitely what result upon the incidence of cancer will be brought out by the crossing of a race of animals, with a small cancer incidence, with another race with a high cancer incidence. We cannot, therefore, state whether the tendency toward cancer is a dominant or a recessive one, and under what conditions the tendency toward or against would prove to be the stronger in the individuals of the mixed parentage.

As the work in these lines is being carried further by the various investigations, we may hope for some definite answer to this and other questions concerning the influence of heredity in cancer.

SPASMOPHILIA.

A REVIEW OF RECENT LITERATURE.

By ALFRED FRIEDLANDER, M. D., of the Editorial Staff.

1. Sedgwick: Spasmophilia with Special Reference to Familial Reactions. (*Amer. Journ. Dis. of Children*, February, 1914.)
2. Aschenheim: Rickets and Spasmophilia. (*Jahrb. fuer Kinderheilk.*, Vol. 79, April, 1914.)
3. Iwamura: Spasmophilia in Japan. (*Zeitschr. fuer Kinderheilk.*, November 15th, 1913.)
4. Rosenstern: Spasmophilia. (*Zeitschr. fuer Kinderheilk.*, January 5th, 1913.)
5. Reitschl: Bronchotetany. (*Monatsschr. fuer Kinderheilk.*, p. 261, 1913.)
6. Grulee: Dietetic Treatment of Convulsions. (*Amer. Journ. Dis. of Children*, March, 1913.)
7. Bernheim-Karrer: Treatment of Spasmophilia. (*Monatsschr. fuer Kinderheilk.*, Vol. XII, p. 453, 1913.)
8. Bluhdorn: Calcium Salts in Spasmophilia. (*Monatsschr. fuer Kinderheilk.*, No. 4, 1913.)
9. Lust: Alkalies and Spasmophilia. (*Muench. med. Wochenschr.*, p. 1482, 1913.)
10. Meyer: Parathyroidin in Spasmophilia. (*Therap. der Gegenw.*, p. 354, 1913.)
11. Berend: Magnesium Sulphate Treatment of Spasmophilia. (*Monatsschr. fuer Kinderheilk.*, October, 1913.)

Spasmophilia, or the spasmophilic diathesis, has been extensively studied of late, particularly by the German school of pediatricists. Essentially the condition consists in a hyperexcitability of the peripheral nervous system, with tendency to chronic and tonic spasms. General convulsions in children, laryngospasm, spasmodic apnea, tetany, etc., are some of the manifestations of this condition. Mechanically the excitability and hyperirritability of the nervous system can be shown by tapping over the 7th nerve in its course along the cheek, with resulting contraction of the muscles around the mouth (Chvostek's sign). Contraction of the arm brings on the tetany position of the hand (Trousseau's sign). Changed electrical reactions are always found and constitute an important diagnostic sign. Recent researches have shown that there is some relationship between spasmophilia and calcium metabolism. It has long been known that the condition is familial and hereditary. Sedgwick reports that in all the cases of infants one year or less of age, examined and found spasmophilic, the nursing mothers have shown definitely lengthened electric excitability. The electric re-

actions of the other members of the families of spasmophilics often bear out the assertion that the condition is familial.

Aschenheim, as the result of a very careful study of the literature and of his original investigations, concludes that rickets, osteomalacia and spasmophilia are all related. The same general symptoms are present and in all there is present the same disturbance of salt metabolism, primarily calcium metabolism. As the etiological factor of greatest importance, we must, therefore, consider that there is a disturbance of the ductless glands controlling salt metabolism. In spasmophilia it is possible that there is disturbance of function of the suprarenal as well. The disturbance of metabolism of these glands may be called forth by a variety of factors: inherited tendency, heredity, respiratory disturbances, acute infections, etc. A complete bibliography is appended. Iwamura offers an interesting observation concerning the occurrence of spasmophilia in Japan. In Japan the infants are mostly breast-fed, so there is very little rickets there. Where there is no rickets, there is very little spasmophilia.

Rosenstern shows that the increased electrical excitability (Erb's phenomenon) is not necessarily the first sign of the condition. In many young infants Erb's sign may be absent and convulsions and laryngospasm present. Among the rarer symptoms of the conditions, bronchotetany should be mentioned. This name was first applied by Lederer to a cramp-like condition of the bronchial muscles, occurring in spasmophilic children. There is cough with rapidly supervening dyspnea and cyanosis. Pulmonary atelectasis may occur. According to Rietschl the condition is very serious. Six cases showing the symptom all died.

Of late much attention has been paid to the therapy of this common and interesting condition. The accepted treatment consists in the withdrawal of cow's milk, the substitution of breast milk when possible, or carbohydrates in the shape of gruels, and the administration of cod-liver oil and phosphorus. Sedatives may be necessary in the active stages. According to Finkelstein, the whey of milk is to be regarded as *the* exciting cause of the spasmophilic attacks. Grulee, in a series of experiments, inclines to the belief that there is an excitant action to whey, and finds that the removal of whey from food renders it non-irritating.

Bernheim-Karrer believes that whey-free food in addition to phosphorized oil is of great value in the treatment of this condition. Under such dietetic regimen the electrical irritability rapidly subsides.

Of late much attention has been paid to the therapeutic value of the calcium salts in this condition, which in view of the modern notion that there is a primal disorder of calcium metabolism is not surprising.

Bluhdorn comes to the following conclusions, as the result of his study of this question. Large doses of calcium salts are necessary, preferably calcium chloride. The effect of calcium is prompt but temporary. It is thus of great value in the early stages, often in association with chloral. It is also of value for the permanent treatment if enough be used (2-3 grm. per day). Under such treatment the dietetic management of the case is made easier, since such foods as the condition of the child demands may be given. It is well to remember that the calcium treatment is really, however, only

symptomatic medication. Bluhdorn recommends a 5 per cent. solution of salt put up with Liq. ammonii anisatus and Acacia mucilago. On the other hand, Lust believes that calcium chloride produces an exaggeration of spasmophilic symptoms in acute cases, or causes the production of such symptoms in latent cases.

Meyer reports a very severe case of spasmophilia in which the usual methods of treatment had been applied for eighteen months without relief. Meyer then tried parathyroidin (1 tablet=0.1 of active gland substance). In eight days there was marked improvement, and after five and a half months complete recovery. A sister of this child with the same condition was treated in the same way without success. It is, of course, questionable whether the good result in the first case could with justice be ascribed to the parathyroidin tablets, as the history shows that even before the use of the tablets the child was beginning to assimilate cow's milk without difficulty.

Another recent contribution to the therapy of this condition is that of Berend. On the theory that there is disturbance both of calcium and magnesium metabolism in this condition, it seems wise to use these salts. Calcium salts when given hyperdermically caused severe focal lesion; the magnesium salts did not, though they produced definite lessening of nervous irritability. After an initial series of experiments in dogs without bad results, Berend began the use of magnesium sulphate solution in infants. An 8 per cent. solution was used, up to 0.2 gm. of the salt to each kilogram of body weight. No toxic symptoms developed, though the dose was given daily in many cases. No infiltration resulted. When given by mouth no good results were seen. Forty cases were treated, 25 of spasmophilic convulsions, 15 of ordinary convulsions. The electrical irritability decreased almost at once, but this effect was transitory. The laryngospasm, carpopedal spasm and convulsions were much improved. In no case, not even in controls, was irritability increased after the magnesium. The treatment rarely had to be given more than four or five days. After the second day a preparation of phosphorus and cod-liver oil was added. The best results were obtained from a diet either of breast milk or of gruels. Artificial feeding is much easier to maintain under this treatment than without it. According to Berend, cases of nephritis and meningitis should not receive the treatment. It would appear from these results that the treatment is worthy of more extended investigation, which up to this time at least has not been reported.

DEVELOPMENTS IN THE SURGERY OF CORNEAL STAPHYLOMA.

A REVIEW OF RECENT LITERATURE.

By JOHN GREEN, JR., M. D., of the Editorial Staff.

1. Attias (*Ophthalmoscope*, January, 1914).
2. Beard : *Ophthalmic Surgery*. Second Edition, p. 402.
3. Coppez (*Soc. Belge d'oph.*, No. 33, p. 29).
4. Dianoux (*Ann. d'ocul.*, Vol. CXVII).
5. Dimmer (*Zentralbl. fuer prakt. Augenheilk.*, August-September, 1913).
6. Komoto (*Arch. fuer prakt. Augenheilk.*, Vol. XXXVI, p. 12).
7. McCallan: *Trachoma in Egypt*, p. 53.
8. Neschitsch (*Zeitschr. fuer Augenheilk.*, Vol. XXV, p. 527).
9. Ziegler : Pre-session Reprint Section on Ophthalmology of the Amer. Med. Assoc., 1914.

The surgery of corneal staphyloma dates from the Alexandrian period of Greek and Roman civilization. It is not surprising that these beauty loving peoples should have devised methods to diminish a deformity which in its higher degrees is irksome to the victim and repulsive to those with whom he comes in contact. The method adopted was that of ligation; a needle bearing a doubled thread was passed horizontally through the base of the staphyloma, the needle was then cut off, and the tumor tightly enclosed within the bight of the thread above and below. Later this method was modified by passing two needles, similarly armed, at right angles to each other. The tumor was then tied off in four sections. Beer, in 1805, proposed and practised simple abscission, without suturing the gaping wound. Critchett, in 1863, in order to retain a part of the vitreous, passed curved needles through the sclera and ciliary body, entering above and emerging below the staphyloma, which was then abscised. Knapp, in 1868, modified the method by quilting his sutures horizontally through the conjunctiva and episclera. De Wecker, in 1873, circumcised the conjunctiva at the base of the staphyloma, abscised the protruding mass, and drew the conjunctiva together with a purse-string suture.

The outcome of these various operations is often very satisfactory: a globular mass of varying size, freely movable by reason of undisturbed muscular attachments. The artificial eye is often remarkably life-like, fully as prominent as its fellow, and with really extraordinary lateral and vertical mobility. The writer has in mind especially a case that occurred in the practice of his colleague, Dr. E. H. Higbee. Knapp's operation was performed on a nine months' baby for staphyloma, the result of ophthalmia neonatorum. To-day the little fellow, aged seven, has a mobile stump, of fairly full tension, over which he wears a shell eye that moves almost

perfectly in all directions. But there is another side to the picture, well described by Beard as follows: "Ophthalmic surgeons are beginning to realize the folly of a procedure that only makes the operated eye a greater menace to its fellow. That is to say, the portion which is admitted to be the source of sympathetic inflammation, the uvea, is not only left behind, but left in a condition more potent for mischief." McCallan is no less outspoken in condemnation. He says: "Staphyloma of the cornea in a blind eye . . . is often disfiguring. The only operation which can be recommended is excision of the globe. The highly unsurgical operation of staphylectomy is, however, performed by some practitioners in Egypt, and results, not infrequently, in damage to the sound eye from sympathetic ophthalmia."

Within recent years a number of surgeons have sought, by methods of much similarity, to diminish the deformity of a staphyloma while preserving, in the main, the integrity of the globe. Dianoux draws a star-shaped figure on the staphyloma by means of a cautery, carrying the cauterization nearly, but not quite, through the tissue. The mass is then perforated centrally, by means of the cautery, and the eye is bandaged with pressure. The procedure of Attias consists in the excision of two or three triangular segments and the approximation of the edges by two sutures crossing diagonally. Komoto transfixes the staphyloma with a Græfe knife, excises a semilune with scissors and brings the edges together with three sutures.

Trephining has been tried by Neschitsch and Coppez. The former removed, with a 6 mm. trephine, a disk from the centre of the staphyloma and claims healing with a flattened scar. The latter, in a case of large recent staphyloma with plus tension, trephined the corneoscleral margin. Three months later the scar had flattened and tension was normal. Dimmer has recently published the following method for flattening partial corneal staphylomata. The epithelium is removed from that half of the staphyloma which lies nearest the limbus. A small flap slightly curved with its convexity towards the limbus is then made by means of a Græfe knife. Doubled armed sutures are passed in such a manner that the centre edge of the flap glides over the peripheral edge and is tightly affixed thereto. The two surfaces adhere and the unevenness gradually disappears.

Ziegler has recently published a method, originally devised and practised by him in 1895. He contends that "when a protruding but circumscribed corneal ectasia has proved to be more or less obstructive to the vision, and the remaining tissues of the globe have not been seriously involved in the pathologic process, conservative surgery demands that a mobile globe shall be preserved, and, whenever it is possible, that a modicum of useful vision shall be secured."

Two forms of operation are described: 'Trefoil' keratectomy adapted to the correction of a partial staphyloma, and 'stellate' keratectomy devised to meet the indications when the whole cornea is involved.

In performing trefoil keratectomy a Græfe knife is passed horizontally through the base of the staphyloma from the temporal to the nasal side, and is made to cut out after the manner of a Sæmisch section. One blade of the scissors is introduced beneath

the upper margin of the horizontal incision, and a long, nearly vertical, cut is made. A second incision, converging to the upper end of the first, is similarly made. The two corners of the opposing wound margins are successively grasped with forceps and a triangular piece excised by scissors from each corner, thus making a three-leaved opening. The opposing surfaces are then approximated by two or three fine black silk sutures.

A corneal punch may be used in place of the scissors, in which case the initial incision is a short vertical one, best made with a keratome.

The method of performing stellate keratectomy is essentially the same, except that the horizontal incision passes through the centre of the staphyloma and four, instead of three, flaps are cut out.

It has been contended, and with some justice, that in the case of laborers, a blind eye, even though unsightly, that is painless and free from congestion, is better for the individual than the best prothesis. If then, a protruding staphylomatous mass can be flattened by operation, and result in a quiet blind eye disfigured only by a flat scar, it is pertinent to inquire whether such a procedure may not only be justifiable but definitely indicated.

For partial staphyloma Ziegler's trefoil keratectomy appeals to the writer as an excellent measure. It seems possible that the technique might be simplified by omitting the approximating sutures and covering the cornea with a double pedunculated conjunctival flap. Possibly a double overlying flap, drawn from either side of the cornea (similar to Francis' double flap for scleral wounds) might serve still better. A greater and greater number of ophthalmic surgeons are using these flaps to great advantage in both linear and jagged wounds of the cornea, and the writer sees no reason why such a flap should not be serviceable in the condition under discussion.

The indications for stellate keratectomy for total staphyloma in a blind eye seem to the writer far less clear. Personally, he feels that an eye so operated is somewhat of a menace to its fellow, and is of the opinion that a much safer course to pursue is either to leave it alone or to enucleate with a fat, glass, or gold ball implantation in Tenon's capsule.

DIAGNOSTIC AND THERAPEUTIC NOTES.

DIET IN HYPERACIDITY.—Strauss (*Deutsch. med. Wochenschr.*, No. 36, 1914). More and more we are coming to realize that hyperacidity, especially when accompanied by hypersecretion, practically always means a gastric or duodenal ulcer. The diet should have three aims: to inhibit the secretion of hydrochloric acid, to irritate the mucosa as little as possible, and to combat the constipation that is usually present. The first indication is best met by the administration of fats, as was shown by the classic work of Pawlow and his pupils. Of these the best are butter, cream and yolk of egg. Tissue fats, such as bacon, are less suitable, while olive oil, milk of almonds and other vegetable fats are very serviceable. The second indication is met by the avoidance of all meat extracts (for instance, beef-tea), coffee (even caffeine-free coffee), carbonated waters, all acids and mayonnaises, and all coarse foods. The constipation may be combated by means of olive oil, sweets (especially the simpler ones), and vegetable purées. Perhaps the most important detail of all is that no such patient should take any meal which does not contain considerable quantities of fat.

INDICANEMIA AND UREMIA.—Tschertkoff (*Deutsch. med. Wochenschr.*, No. 36, 1914). The presence of considerable quantities of indican in the blood is the earliest and most trustworthy evidence of impending uremia. Where only small quantities of blood are obtainable, the following test for indican may be used.

One c.cm. of blood is allowed to flow into a test-tube and to coagulate. Three times its bulk of 20 per cent. trichloroacetic acid is added and the mixture filtered into a very narrow test-tube. Here it is shaken with an equal quantity of Obermayer's reagent (see any textbook) and 0.3 c.cm. of chloroform. In the absence of iodides, a blue color indicates the presence of indican. His observations led him to the following conclusions:—

1. Healthy individuals and patients without renal insufficiency never show indican in the blood-serum.

2. Indican is always present in the serum of patients who have retention of urea.

3. Indicanemia in chronic nephritis is an eminently unfavorable sign. It indicates a grave and irreparable renal lesion.

4. In acute nephritis, an indicanemia shows merely the state of the kidneys for the time being. It has here not the ominous significance that it possesses in chronic nephritis.

5. In chronic nephritis, indicanemia may be the only indication of impending uremia.

COAGULEN. — Juliusburger, Mutschenbacher (*Deutsch. med. Wochenschr.*, No. 34, 1914). Coagulen has already been referred to in these columns. It was first prepared by Fonio, in 1912, from animal blood-platelets, obtained by fractional centrifugation, and was tried out clinically by Kocher. It is manufactured and marketed by the "Ciba" Company of Basle (A. Klipstein and Co., New York). It is a physiological hemostatic and, judging from the reports proceeding from a number of German clinics, promises soon to be in general use.

At the municipal hospital, at Breslau, its intravenous use proved valuable both in hemoptysis and hematemesis. The writer believes it would be eminently indicated in hemophilia. At Budapest it was used chiefly locally in operations in which perfect hemostasis was important. Among these may be mentioned abdominal operations with defects of the serosa, bleeding liver parenchyma after extirpation of the gall-bladder, plastic operations and transplantations, operations in which an empty cavity is left behind.

BRONCHIAL ASTHMA AND THE BAROMETER.—Baar (*Wien. klin. Wochenschr.*, Nos. 29, 30, 1914). Baar has studied the effect of the barometric pressure upon the incidence of asthmatic attacks. He found that patients with chronic bronchial asthma always suffered more when the barometer was falling, while those who had only occasional attacks were more apt to have specially severe ones during these times. He thinks the falling atmospheric pressure may exercise some influence upon the pulmonary vasus.

THE SIGNIFICANCE OF BLOOD-PRESSURE IN INFECTIOUS DISEASES.—Schwarzmann (*Zentralbl. fuer inn. Med.*, No. 31, 1914). The writer concludes, from his observations, that a high diastolic pressure indicates a paresis of the abdominal vessels, while a fall both in systolic and diastolic pressure signifies a relaxation of the general vascular tonicity. A diminution of the systolic pressure, accompanied by a rise of the diastolic pressure, points to an impairment of the cardiac energy.

TREATMENT OF SOFT CHANCER BY MEANS OF ARGYROL SOLUTIONS.—Ravary (*Jour. d' Urol.*, Vol. 4, No. 6). The case described was one of soft chancre, causing a deep ulceration at the lower commissure of the meatus. Many Ducrey bacilli in the discharge; Wassermann reaction negative. Cauterization, calomel ointment, iodoform, hot applications, all proved unavailing. Finally a bit of gauze, saturated with 20 per cent. argyrol was placed over the ulcer and held in place by means of the prepuce, being renewed after each micturition. The results were surprisingly good. The ulcer was almost dry twenty-four hours later and completely healed within five days. In two similar cases, one of them a mixed infection, the results were nearly as good.

A NEW BLOOD TEST FOR SYPHILIS.—Hirschfeld and Klinger (*Sem. Méd.*, August 5th, 1914). The organ extracts, used for the Wassermann reactions, exhibit a strong coagulative action when brought into contact with non-syphilitic blood-serum, but not when mixed with blood-serum from a syphilitic. The writers have utilized this phenomenon in the elaboration of an alternative test for the Wassermann reaction. For the technique, the reader must be referred to the original article. The results are promising. In 750 cases in which the results of the Wassermann test and coagulo-reaction were compared, an almost complete concordance of the two tests was noted, the latter even proving superior by being positive in cases of syphilis under treatment and cases of latent syphilis in which the Wassermann reaction was negative. The coagulo-reaction, in spite of its relative simplicity, will not, in the author's estimation, replace the Wassermann, now adopted everywhere, but may be useful as a control test where the Wassermann is doubtful, and, being more sensitive than the Wassermann, seems to be indicated for use where the physician wishes carefully to trace the course of the disease and determine the effect of treatment.

LANDAU'S TEST FOR SYPHILIS.—Laudau (*Presse Méd.*, No. 35, 1914). It has been shown that the Wassermann reaction is not a specific antigen and complement reaction but depends upon a precipitation of colloids by lipoids contained in the extracts. Landau has attempted to obtain the same result more simply by testing the behavior of syphilitic serum towards iodine. The latter is dissolved in oil and is decolorized by contact with syphilitic serum, but is not affected by non-syphilitic sera. Of 90 definitely syphilitic sera, 49 showed a positive Wassermann reaction and 55 a positive Landau. All but one of the 32 control sera gave a negative reaction. The test is made still more striking by adding a dilute solution of starch. Non-syphilitic sera give a deep blue color, while syphilitic serum remains pale yellow. Recently, Landau has improved the test by dissolving the iodine, not in oil, but in tetra-chlormethane.

BOOK REVIEWS.

INFECTION AND RESISTANCE. An Exposition of the Biological Phenomena Underlying the Occurrence of Infection and the Recovery of the Animal Body from Infectious Disease. By Hans Zinsser, M. D., Professor of Bacteriology of the College of Physicians and Surgeons, Columbia University, New York, etc. etc. With a Chapter on Colloids and Colloidal Reactions by Professor Stewart W. Young, Department of Chemistry, Stanford University. New York: The Macmillan Company. 1914. Price, \$3.50.

While there are many books on immunity at the present time, and many special chapters in a wide variety of textbooks and systems of medicine relating to the above subject, still one is grateful to the author for compiling so helpful a volume as this on the broad subject of infection and resistance, for now this subject has overflowed its original source to such an extent that it cannot be confined to a few brief chapters in a textbook of pathology, bacteriology, or chemistry.

The study of the bacteria themselves is a simple matter compared with the study of the substances they produce, and, what is even more complicated, the study of the substances which the cells and fluids of the body produce to combat bacterial invasion. Therefore, when we have journeyed from Pasteur and Koch to Metchnikoff and Ehrlich on to Bordet and Wassermann and Wright, and finally arrive at Abderhalden and Jacques Loeb, it is not surprising that we need a book to contain it all. We can earnestly commend this book of Dr. Zinsser's as a well-written, complete and comprehensive survey of this field of medicine. Briefly to summarize this work, we may say that the following subjects are considered: Infection and the problem of virulence, including the classification of parasites, specificity of different infections, localization, and incubation. Bacterial poisons, including ptomaines, endotoxins, snake venoms, importance of cell lipoids, natural, acquired, and artificial immunity, with a survey of the subject in a general way from the time of Jenner to Ehrlich's work on ricin. The mechanism of natural immunity and the phenomena of immunization are considered, including the work of Buchner, Nuttall, Pfeiffer, and brings us up to the hemolysins, toxin and antitoxin, including Ehrlich's side-chain theory, bactericidal properties of blood-serum, and cytolysis form a chapter. Development of our knowledge concerning complement, including Bordet-Gengou experiments, follows. The Wassermann reaction, agglutination, phagocytosis, from Metchnikoff to Wright, and including vaccine therapy are considered. Anaphylaxis, including fundamental facts and theories, bacterial reactions are included. There is a chapter on Abderhalden's work on protective ferments. The book ends with a special chapter on colloids.

THE FUNDAMENTAL BASIS OF NUTRITION. By Graham Lusk, Professor of Physiology, Cornell University Medical College, and Scientific Director of the Russell Sage Institute of Pathology. New Haven: Yale University Press. 1914. Price, \$0.50.

This little book is really worth while, not only because it is well written, but because it is filled with common sense, a quality sadly lacking in most books on nutrition. If there is any subject which allows writers of low or high degree, in regard to scientific training, to run amuck to a greater extent than does the matter of what we ought to eat, we have never heard of it; and we are expressing this opinion because every month there comes to our desk a book that apparently has been written only to exploit some dietary vagary on the part of the author. Of this sort is not the book under consideration, for on every page are expressed opinions which indicate a degree of sanity for which only praise should be given the author by the intelligent reader. To quote: "Voit's ration contains about four times the minimal quantity of protein necessary for the maintenance of life. Voit's dietary has been condemned as financially extravagant and even physiologically harmful. Evidently many millions of dollars could be saved in the army and navy were the protein of the ration cut in two. Rubner recently appeared twice before the German authorities to protest against such reduction. He believes that

there should always be an excess of protein constructive material, so that if after physical exhaustion there is depletion of the glycogen reserves, under which circumstances the wear and tear on the cell protein is increased, there may be building units in reserve to quickly restore the tissue destroyed. For a laboring man to take the minimal quantity of protein in the diet is, therefore, not desirable. Meltzer has truly pointed out that eating protein in quantities above the minimal requirement is one of the many 'factors of safety' in human life." And yet there are many scientific (?) doctors whose criticism of Voit is quite acrimonious.

TREATISE ON DISEASES OF THE SKIN. For the Use of Advanced Students and Practitioners. By Henry W. Stelwagon, M. D., Ph. D., Professor of Dermatology in the Jefferson Medical College, Philadelphia, etc. etc. Seventh Edition, Thoroughly Revised. With 334 Illustrations in the Text, and 33 Full-page Colored and Half-tone Plates. Philadelphia: W. B. Saunders Company. 1914. Price, \$6.00.

Among all the books on the subject of dermatology, or cutaneous medicine, the latest edition of this book easily takes rank as one of the classics. While the progress made does not begin to compare with other subjects of medicine, the present edition covers, in a most thorough and comprehensive manner, the latest and most up-to-date ideas in etiology, pathology and treatment of skin diseases. It must, however, be admitted that as regards the etiology of many of the diseases of the skin but little is as yet known; still, on the basis of the progress shown by the present edition as compared with the last, encouragement is offered that in the near future much that is still obscure and problematical will be cleared up. Especially to be commended among the newer ideas is that portion devoted to the treatment of syphilis with salvarsan. A number of the diseases prevalent in the tropical climate have also been more fully described. From the standpoint of mechanical execution the book is well printed on good paper, in clear type, and the numerous and fairly good-sized cuts are faithful representations of the diseases they portray. The only criticism to be made is the fact that too much circumlocution is used, and that the average busy practitioner cannot find the time to wade through the mass of detail contained in its more than 1,200 pages.

A TEXTBOOK OF ANATOMY FOR STUDENTS OF MEDICINE. By J. George Adami, M. A., M. D., F. R. S., Strathcona Professor of Pathology, McGill University, and Advisory Pathologist to the Montreal General and the Royal Victoria Hospitals, Montreal, Canada, etc. etc., and John McCrae, M. D., M. R. C. P. (Lond.), Lecturer in Pathology and Clinical Medicine, McGill University, Montreal, etc. etc. Second Edition, Revised and Enlarged. Illustrated with 395 Engravings and 13 Colored Plates. Philadelphia: Lea and Febiger. 1914. Price, \$5.00.

To those familiar with Adami's "Principles of Pathology" (the two volume edition) praise is unnecessary for the careful rearrangement into the more practical "Textbook of Pathology." What was said of the first edition of this textbook holds in increased measure for the second edition. The subject-matter, particularly on certain infections, has been enlarged upon and many new illustrations added.

This volume is undoubtedly one of the best works on pathology that we have. It is compact and yet fairly complete. It is written in readable style, and while necessarily technical, it is less so than most books on this subject, so that it is especially adapted to the general practitioner who has forgotten somewhat (perhaps to his advantage) the pathology of his student days.

The illustrations, while not elaborate, are all good and include thirteen colored plates. The book is well printed and well indexed; the arrangement of a syllabus at the beginning of each chapter is a considerable aid to the reader.

NERVOUS AND MENTAL DISEASES. A Manual for Students and Practitioners. With an Appendix on Insomnia. By Joseph Darwin Nagel, M. D., Consulting Physician to the French Hospital of New York, etc. etc. Second Edition, Thoroughly Revised, Including Selected List of State Board Examination Questions. Illustrated with 50 Engravings and a Colored Plate. Philadelphia: Lea and Febiger. 1914. Price, \$1.00.

There is little to be said either in praise or unfavorable criticism of this book. It is an attempt to describe the chief types of mental and nervous diseases within the limits of a few hundred pages. It is mostly definitions and short descriptions of important symptoms. At the end of each chapter is

a list of questions designed apparently to assist the student in passing examinations, especially those of the State Boards.

According to the author's introduction, the book was built upon the three foundation stones of brevity, clearness, and comprehensiveness. The reviewer can find only one of these qualifications that has been met, that is the first. The descriptions are certainly not clear and lack much of comprehensiveness.

The evident purpose of the book is to enable students to pass examinations; and as far as passing examinations may mean the gathering of facts in a student's mind to be given out at a stated time in answer to questions, it can be said the book meets its requirements. Beyond this there is nothing that the reviewer can say. It is a rather sad commentary on our methods of examination that there is need of a book of this sort.

A MANUAL OF DISEASES OF THE NOSE AND THROAT. By Cornelius G. Coakley, A. M., M. D., Professor of Laryngology in the College of Physicians and Surgeons, Columbia University, etc. etc. Fifth Edition, Revised and Enlarged. Illustrated with 139 Engravings and 7 Colored Plates. Philadelphia: Lea and Febiger. 1914.

The fifth edition of Coakley's work on the diseases of the nose and throat is just from the press. The appearance of so many editions in so short a time shows that the manual, though less ambitious than some of the larger works, still finds a large and appreciative audience. The effort of the author as stated in his preface has been "to provide a compact manual, answering the need of both students and practitioner. Special attention has, therefore, been devoted to the more practical sections." This aim he has most thoroughly satisfied.

The book is a model of compactness, together with brevity and clearness of expression. As a textbook for students we doubt if it has a superior or few equals. With the limited time devoted to the specialties in the modern medical curriculum there is a decided demand for just this type of book. It is unfortunate that there does not exist a similar book on diseases of the ear as a companion volume.

THE INTENSIVE TREATMENT OF SYPHILIS AND LOCOMOTOR ATAXIA BY AACHEN METHODS. By Reginald Hayes, M. R. C. S., etc. London: Baillière, Tindall and Cox. 1914. Price, 3 s. 6 d.

This little book is an outline of the intensive methods used in treating syphilis and locomotor ataxia by the inunction of mercury as practised by Aachen.

The key-note to the method herein described is this note in the preface: "Let me emphasize at the outset that I do not look upon the inunction of mercury in any way as a rival to salvarsan; both are of the greatest value. Each has its appropriate sphere, and of necessity its limitations."

This little book has an additional value at the present time when, owing to the limitation in the supply of salvarsan, many will be compelled to resort to methods of treatment which were in vogue before this remedy was on the market.

In the concluding pages of the book are set down a number of cases of paresis and tabes showing the effects of treatment. The author apparently lays great stress on the amount of mercury which can be given to the patient by the methods which he describes.

The high note of optimism in the account of his successes is rather curious.

THE CLINICS OF JOHN B. MURPHY, M. D., AT MERCY HOSPITAL, CHICAGO. Volume III, Number IV. August, 1914. Published Bi-Monthly. Philadelphia: W. B. Saunders Company. 1914. Price per year: \$8.00.

This set of the Clinics is on a distinctly higher plane than have been the last two or three numbers. The substance is solid, and the manner of presentation good. In other words, there has been manifestly improved team work between author, editor and proof-reader. The introductory clinic on Ileus is particularly good as is also the clinic on Paget's cancer. Much good would result from a wider adoption of the views held by Murphy regarding this insidious type of malignant disease.

The Clinics contain descriptions of arthroplasty of the hip, ascending root neuritis, malignant papillomatous cyst of the breast, old ununited Colles' fracture, facial nerve palsy, intra-uterine fibroids, carcinoma of the rectum, sarcoma of the humerus, cerebellar tumor, luxation of the patella, and post-operative ventral hernia. This is a variety of material in notable contrast with the last three or four volumes.

DEFECTIVE OCULAR MOVEMENTS AND THEIR DIAGNOSIS. By E. and M. Landolt (Paris). Translated by Alfred Roemmele, M. B., Ch. B., and Elmore W. Brewerton, F. R. C. S. New York: Oxford University Press. 1913. Price, \$2.00.

In this little work the authors have endeavored to collate the facts necessary for knowledge of the oculomotor actions, particularly those which are most apt to be overlooked or forgotten. Pathology is preceded by a short summary of anatomy and physiology. The symptoms of paralysis are explicitly classified and elucidated by diagrams. Inasmuch as the nature and seat of the lesion can only be deduced from the symptoms, the authors have wisely abandoned the usual textbook practice of first naming the disease and then describing its symptoms; on the contrary, they begin with the symptoms and lead up to the disease which causes them. The authors state that they have not attempted to write a handbook but merely a handy book, a guide to aid the student and practitioner in finding his way over the oculomotor system, a path on which it is so easy to go astray.

MORPHOLOGISCHE GRUNDLAGEN DER ORGANOTHERAPIE. Von Prof. Dr. Alfred Kohn in Prag. Mit 35 Textabbildungen. Sonderabdruck aus: Lehrbuch der Organotherapie. Leipzig: Verlag von Georg Thieme. 1914. Price, 1.60 m.

The entire field of organotherapy is at present a maze of contradictions and obscurities. Empirically, the substance of the thyroid gland, of the adrenals and of the pituitary body, have won recognized places in therapeutics; the mode of their action and their physiologic function are still matters of hypothesis. Still less is known of the internal secretions of the sexual glands, the pancreas and the like. Any genuine growth of our knowledge in this field must be based upon close study of the anatomy and physiology of the glands themselves. The former is the subject of the monograph under discussion. First published as a portion of a textbook of organotherapy, it presents concisely but adequately a description of the morphology of each gland whose power of internal secretion seems established. It deserves study as a good presentation of our knowledge in this field.

THE CLINICS OF JOHN B. MURPHY, M. D., AT MERCY HOSPITAL, CHICAGO. Volume III, Number II. Octavo of 212 pages, 55 illustrations. April, 1914. Philadelphia and London: W. B. Saunders Company. 1914. Price, per year, \$8.00.

This volume of the Clinics adheres very closely to the method laid down by Dr. Murphy in former volumes, except for the fact that there is an introductory talk on surgical diagnosis. This introductory exposition is very comprehensive in tone, and emphasizes what Dr. Murphy has so often before insisted upon, that no pathological condition can be thoroughly understood or effectively treated unless the patient has been most thoroughly examined.

The Clinics discuss empyema, ectopic pregnancy, the Abderhalden test, undescended testicle, cholelithiasis, pancreatic cyst, duodenal ulcer, goitre, tuberculosis of the kidney, papilloma of the bladder, amputation neuroma and hemorrhoids.

COLLECTED PAPERS BY THE STAFF OF ST. MARY'S HOSPITAL MAYO CLINIC, ROCHESTER, MINNESOTA. 1913. Philadelphia and London: W. B. Saunders Company. 1914. Price, \$5.50.

This volume, which stands as the preservation in permanent form, of work done at the Mayo Clinic, defies detailed review. It is a volume of over eight hundred pages, devoted to eighty odd contributions by twenty-eight contributors. The papers are grouped and classified under the several headings: Alimentary Tract, Urogenital Organs, Ductless Glands, Head, Trunk and Extremities, Technique, and General Papers. It is of more than passing interest to note the wide scope covered by the various contributions—purely clinical surgery, pathology, roentgenology, serology, physiology, and clinical microscopy are all represented, and represented in very satisfactory fashion.

The volume is an excellent exemplar of the best in book-making, the pagination, illustrations and typography being above criticism.

LECTURES ON MEDICAL ELECTRICITY TO NURSES. By J. Delpratt Harris, M. D. Durh., M. R. C. S., Senior Surgeon and Honorary Medical Officer in Charge of the Electrical Department, Royal Devon and Exeter Hospital. Published by Paul B. Hoeber, 69 East 59th Street, New York. 1913. Price, \$1.00.

This little book offers a very superficial analysis of electrical apparatus

and its manipulation as used in the various modalities employed in medical electricity and the Roentgen rays. The book will probably be very acceptable to nurses using medical electricity, as the descriptive language is simple and explicit.

DIGALEN. Von Dr. A. Eisenhammer. Wuerzburg: Verlag von Curt Kabitzsch. 1913. Price, .85 m.

Digalen, a solution of a substance isolated in 1904 by Cloetta out of digitalis leaves, and supposed by him to be digitoxin, but now known to be digitalein, an entirely different alkaloid, has been exploited by the proprietors for many years with the utmost energy. The result has been a literature on the use of this preparation out of all proportion to its undoubted value. This literature has been summarized in brief compass by the author, and anyone who desires to familiarize himself with the results obtained with the drug by European clinicians, chiefly German and Italian, will be glad of this monograph. Inevitably perhaps, the favorable opinions have rather crowded out the unfavorable ones; inevitably because the former would naturally be published far more readily than the latter.

GEHOERORGAN UND BERUF. Von Dr. Oskar Mauthner, Maehr-Ostrau. Wuerzburg: Verlag von Curt Kabitzsch. 1914. Price, .85 m.

After a brief discussion of the anatomy and physiology of the ear, the monograph takes up in turn two subjects: The bearing of impaired hearing upon the choice of an occupation and the various occupational lesions to which the sense of hearing is subject. In connection with the former, the author pleads for the appointment of aurists as school inspectors, especially in the upper grades. Many young people, with progressive ear trouble, have been rendered miserable by the choice of an unsuitable occupation. Thus they should not become teachers, lawyers, salesmen and the like, but may become printers, gardeners, painters and sculptors, blacksmiths, and a long list more. The monograph should be of interest not only to physicians but to sociologists.

A MEDICAL DICTIONARY FOR NURSES. Giving the Definition, Pronunciation, and Derivation of Terms Used in Medicine, together with Supplementary Tables of Weights, Measures, Chemical Symbols, etc., Arranged with Special Reference to Use by Nurses. By Amy E. Pope, Graduate of the School of Nursing of the Presbyterian Hospital, in the City of New York, etc. etc. New York: G. P. Putnam's Sons. 1914. Price, \$1.00.

The purpose of this book, "to provide a medical dictionary containing a detailed definition of words and terms of special importance to nurses," is very adequately fulfilled. The volume makes a convenient reference book and will serve a particularly useful purpose both to the nurse in training and the graduate. The book is well printed on good paper and neatly bound.

PRACTICAL BANDAGING. Including Adhesive and Plaster-of-Paris Dressings. By Eldridge L. Eliason, A. B., M. D., Assistant Instructor in Surgery in the University of Pennsylvania Medical School, etc. etc. 155 Original Drawings and Photographs. Philadelphia: J. B. Lippincott Company. 1914. Price, \$1.50.

This small manual, written specifically for nurses and students, serves a good purpose. The tone is consistently didactic, and the style is elemental in its simplicity. Every possible type of bandage is described and the descriptions are profusely illustrated.

THE HOME NURSE. By E. B. Lowry, M. D., Author of "Herself," etc. etc. Chicago: Forbes and Company. 1914. Price, \$1.00.

The book is designed to give to the untrained home nurse such instruction as will enable her to carry out intelligently the physician's orders. It contains chapters on the sick-room, bed-making, baths, the nurse's written report, enemas, etc. The book does not belong to the type of "Family Prescribers," and can be put into the hands of laymen without fear of provoking that danger which comes of a little knowledge.

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